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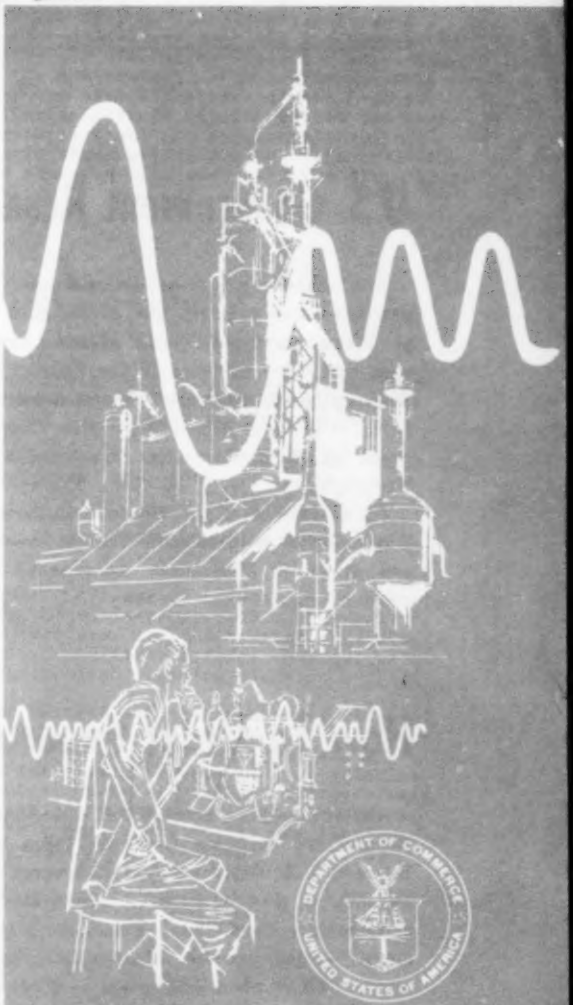

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
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U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

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U.S. Government Research Reports

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-256 964 Div. 1, 9
(5 June 61) OTS price $7.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
STATIC STABILITY CHARACTERISTICS OF THE PROPOSED B-58 AIRCRAFT ESCAPE CAPSULE AT TRANSONIC MACH NUMBERS,
by L. E. Rittenhouse, D. J. Pierce, and W. E. Summers. May 61, 72p. incl. illus. tables (Rept. no. AEDC TN 61-43)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: Model tests, Stability, Lift, Stability (Lateral), Stability (Longitudinal), *Jet bombers, Bombers, *Jet planes, Drag, Transonics, Aerodynamics, Aerodynamic configurations, *Parachutes, Supersonics, *Jettisonable cockpits, Rocket motors, Exhaust gases, Jettisonable equipment, Aviation personnel, Safety devices, Transonic flow.

Results are presented from a wind tunnel investigation to ascertain the lateral and longitudinal stability and axial-force characteristics of the crew and pilot escape capsules proposed for the B-58 aircraft. The effect of varying several parachute parameters on parachute drag and capsule aerodynamics is also presented. Furthermore, a comparison of the capsule aerodynamic coefficients obtained with cold air simulation of the rocket exhausts in contrast to rocket motor firings is discussed. The tests were conducted at Mach numbers 0.60, 0.93, and 1.50 at Reynolds numbers ranging from 0.40 to 2.20 million. The test article attitude was varied from -10 to 90 deg in the pitch plane and from -5 to 25 deg in the yaw plane. In general, both capsule configurations were statically unstable in the pitch and yaw planes. Furthermore, when the rocket jet was simulated, the parachute which was attached to the capsule dipped violently in and out of the jet wake. (Author)

AD-257 065 Div. 1, 19
(5 June 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
REPEATABILITY OF THE OVER-ALL ERRORS OF AN AIRPLANE ALTIMETER INSTALLATION IN LANDING-APPROACH OPERATIONS,
by William Gracey and Joseph W. Stickle. May 61, 19p. incl. illus. tables (Rept. no. TN-D-898)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-898.

DESCRIPTORS: Airplane landings, Flight instruments, Statistical analysis, Flight testing, *Transport planes, *Altimeters, Errors, Airplanes, Navigation, *Liaison planes.

Flight tests were conducted to determine the repeatability of the over-all altimetry errors in the landing-approach condition of two sensitive altimeters (Air Force type C-12) installed in the cockpit of a transport airplane and of four precision altimeters (Air Force type MA-1) installed in a photo-observer. Data were obtained through a speed range of 62 to 100 knots during 42 landing-approach operations conducted on four different days. The repeatability errors of the two sensitive altimeters were + or -35 ft and + or -39 ft. For each of the four flights the mean values of the data obtained with the two sensitive altimeters shifted by relatively large amounts, apparently because of the interaction of the stability and aftereffect-recovery characteristics of the instruments. For concurrent measurements of the over-all errors of the four precision altimeters, it is concluded that for comparable installations, the repeatability errors measured with these altimeters would be smaller than those measured with the sensitive altimeters. (Author)

AD-257 066 Div. 1
(5 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AN INVESTIGATION OF LANDING-CONTACT CONDITIONS FOR TWO LARGE TURBOJET TRANSPORTS AND A TURBOPROP TRANSPORT DURING ROUTINE DAYLIGHT OPERATIONS,
by Joseph W. Stickle. May 61, 22p. incl. illus. tables. (Rept. no. TN-D-899)
Unclassified report

Also Available from NASA, Washington 25, D. C., as NASA Technical note D-899.

DESCRIPTORS: *Transport planes, *Jet planes, *Runways, Statistical analysis, Airports, Airplane landings, Flight testing, Landing, Probability, Aviation safety, Design, Load distribution, Landing fields.

Statistical results are presented of an investigation to determine the vertical velocity, airspeed, rolling velocity, bank angle, and distance from the runway threshold, just prior to ground contact. A total of 395 landings of two turbojet transports and a turboprop transport were made on a dry runway at the Los Angeles International Airport. (Author)

AD-257 074 Div. 1
(6 June 61) OTS price $9.10

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
CATEGORY II HIGH TEMPERATURE EVALUATION OF A T-38 AIRCRAFT,
by Clair K. Sandstrom and Billy L. White. May 61, 96p. incl. illus. tables.
(Proj. 4201)
(WADD TN 60-283) Unclassified report

Division 1-AIRCRAFT AND FLIGHT EQUIPMENT

DESCRIPTORS: *Supersonic planes, *Training planes, Jet planes, Desert tests, Flight testing, Test methods, Instrumentation, Tests, Temperature, Climatic factors.

The T-38A aircraft was subjected to flight and static tests at ambient temperatures up to 115 F at the El Centro Naval Auxiliary Landing Field, California. No serious deficiencies were encountered. The cockpit temperatures were unsatisfactory; however, the refrigeration package in the test aircraft was not a production unit and is to be replaced by a more efficient unit in the production aircraft. Tests proved maintenance of the aircraft in a desert climate presents no unusual problem, but strict adherence to operational procedures, as affected by high temperatures, is necessary. (Author)

AD-257 111 Div. 1, 5, 6, 8, 9, 10, 16, 27, 28
(5 June 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ANNUAL REPORT OF THE GERMAN AERONAUTICAL TEST LABORATORIES, 1958.
Jan 61, 65p. 47 refs. (Trans. no. MCL-136 from Deutsche Versuchsanstalt fur Luftfahrt (DVL) 1958)
Unclassified report

DESCRIPTORS: *Aeronautics, Germany, Radio equipment, Control systems, Aviation fuels, Human engineering, Medicine, Mechanics, Flight instruments, *Microwaves, Stresses, Jet engine fuels, *Jet propulsion, *Thermodynamics, *Lubricants, *Aviation medicine, Documentation, Test equipment, Turbulence, Radar equipment, *Air traffic control systems, Combustion, Turbulent flow, Gas flow, Aerodynamics, Dynamics, Aircraft, Airframes.

Contents:
Aircraft radio institute
Institute for control and regulating engineering
Aeromedical institute
Institute for applied mathematics and mechanics
Testing station for aeronautical instruments
Department for scientific reporting and documentation
Institute for microwaves
Institute for aircraft fuels and lubricants
Institute for engine dynamics
Test stand in Garmisch-Grainau
Institute for jet propulsion
Institute for thermodynamics and combustion
Institute for strength investigations
Institute for turbulence research
Institute for theoretical gas dynamics
Institute for flight mechanics
Institute for applied gas dynamics

AD-257 113 Div. 1, 27
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AIRCRAFT WITH MIXED POWER UNITS (Lietadla So Zmiesanymi Pohonnymi Jednotkami).
18 Oct 60, 8p. (Trans. no. MCL-307 from Kridla Vlasti 8:24-25, 1959)
Unclassified report

DESCRIPTORS: Fighters, *Antiaircraft defense systems, *Jet fighters, *Jet bombers, Radar ranges, Search radar, Detection, *Rocket motors, *Turbojet engines, Booster rockets, Technological intelligence, *Rocket planes, Rocket propulsion, Jet propulsion, Thrust, Acceleration, Fuel consumption, USSR.

Fighter aviation is regarded as constituting an important component of antiaircraft defense. One of the most significant marks of superiority of the fighter aircraft over the bomber is speed. Radar detection time for a typical modern bomber is 25 minutes before the bomber reaches its target. One possibility which can be used to improve the defense system is to construct a fighter aircraft with better flying characteristics. This can mean the employment of mixed power plants on fighter aircraft. The power plant described is the turborocket engine. It consists, essentially, of a turbojet engine, in which the entire air passed by the compressor flows around the engine. The power for turbine action is obtained from the chemical decomposition of special 1-component mixtures. The products of decomposition, together with the air passed by the second chamber, are used in burning the fuel in outlet jets, thus generating the thrust which can be compared with the thrust developed by a turbojet engine with booster.

AD-257 117 Div. 1
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A LIFTER FOR THE SM-1 (Dzwig Dla SM-1).
18 Oct 60, 2p. (Trans. no. MCL-334 from Skrzydlata Polska 27:pp. 417, 1959)
Unclassified report

DESCRIPTORS: Helicopters, Helicopter hoists, Design, Poland.

A lifting device was developed for use with the SM-1 helicopter. It is operated by a special motorized hydraulic pump. The lifter is designed to lift weights up to 120 kg. It is attended from the cockpit by the operator, with the aid of a single control knob. The lifting speed is about 0.66 meters per second. Operational tests demonstrated the effectiveness of the lifter.

AD-257 123 Div. 1, 27
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
JET HELICOPTERS (Reaktivnyye Vertolety), by V. Biryulin. 19 Jan 61. 8p. incl. illus. (Trans. no. MCL-381 from Grazhdanskaya Aviatsiya 7:32-34, July 59)
Unclassified report

DESCRIPTORS: *Helicopters, *Jet helicopter rotors, Helicopter blades, Gas turbines, *Jet engines, Turbojet engines, Compressors, Transport planes, *Technological intelligence, USSR.

Research is concerned with the development of jet helicopters in the Soviet Union. The following observations were made: (1) jet engines can be used to operate mechanical rotors or jet-powered rotors on helicopters; (2) gas turbine engines for mechanical transmission of power to the rotors have serious weaknesses; (3) jet-powered rotors have much better capabilities and can be placed on the tips of the blades or in the fuselage; (4) turbojet engines are the best for tip mounting; and (5) a compressor-driven rotor with the gas turbine mounted in the fuselage is the simplest type of single-rotor helicopter and has many inherent advantages.

AD-257 126 Div. 1, 27
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
IS THERE AN ALTITUDE LIMIT FOR AIRCRAFT (Limeyet Li Predel Vysota Poleta Samoletov),
by N. Mekonoshin. 24 Oct 60, 7p. incl. illus. (Trans. no. MCL-399 from Krasnaya Zvezda 203: pp. 1, 29 Aug 59)
Unclassified report

DESCRIPTORS: *High altitude, *Flight, *Aircraft, Aerodynamics, Lift, Jet engines, Turbojet engines, Centrifugal fields, USSR.

AD-257 308 Div. 1
(8 June 61) OTS price $3.60

Pitman-Dunn Labs. Group, Frankford Arsenal, Philadelphia, Pa.
DEVELOPMENT OF THRUSTER, CARTRIDGE ACTUATED, T29,
by C. S. Sterrett, Dec 60, 33p. incl. illus. (Rept. no. R-1550)
(WADD TR 60-342) Unclassified report

DESCRIPTORS: *Cartridges, *Explosive actuators, Aircraft equipment, *Jettisonable equipment, Design, Tests.

Studies conducted by Boeing Airplane Company showed that the maximum thrust of the standard hatch-unlock and hatch-jettison thrusters on the B-52 Airplane was not sufficient, under certain flight conditions. It was decided to modify the M1A1 thruster so that it would provide bypass gas to actuate two hatch-jettisoning units. The original performance of the M1A1 thruster was to be retained. The standard M1A1 thruster was modified to give it the required performance characteristics. Five of these modified thrusters, designated Thruster, Cartridge Actuated, T29, were fabricated and successfully fired under load at -65F. (Author)

AD-257 371 Div. 1, 16
(12 June 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
SOME BODY DISPLACEMENTS AND MEDICAL EFFECTS OF LATERAL ACCELERATIONS DURING NAVY CENTRIFUGE SIMULATION OF EJECTION CAPABILITIES FROM THE ARMY AO AIRCRAFT,
by Carl C. Clark. Final rept. 11 Apr 61, 23p. incl. illus. table, 20 refs. (Rept. no. NADC-MA-6044)
(Proj. TED no. ADC RAAE-23012)
Unclassified report

DESCRIPTORS: *Ejection seats, Safety, Safety harness, *Pilots, Body, Motion, Damping, Resonance, Acceleration, Centrifuges, Simulation, Ejection.

For steadily applied lateral loads in the Martin-Baker Mark J5 Ejection Seat and restraint system in use in the YAO-1 aircraft, lateral displacement of the pilot is such as to make questionable safe ejection at 2 G past the canopy beam located 12.5 in from the seat center, even with the restraint harness tighter than would be the case in general flying. With additional equipment on the pilot inside of the restraint harness, lateral displacements will probably be increased. For steadily applied lateral loads above 2 G, this study indicates that lateral displacements of the pilot would preclude safe ejection. The theoretical discussion in the previous section indicates that either body motion damping effects, reducing displacements, or resonance overshoot effects, increasing displacements might occur for the shorter duration acceleration pulses of aircraft in-flight accidents. Unit such time as the resonance frequencies and damping of this man-seat-restraint system can be determined, the shoulder displacement values of this study are reasonable predictions of displacements to be expected in aircraft experiencing similar acceleration components. (Author)

AD-257 374 Div. 1
(12 June 61) OTS price $1.10

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
TORSO-HEAD RESTRAINT SYSTEM FOR THE MODEL F4H-1 AIRPLANE.
Final rept. 20 Feb 59, 2p. illus. tables (Rept. no. MA-82-1390)
(Proj. TED no. ADC AE-5209.1)
Unclassified report

DESCRIPTORS: Aircraft, *Safety harness, Flight testing, Attack bombers, Acceleration, Effectiveness, Ejection seats, Aircraft seats, Simulation.

A study was conducted to evaluate an experimental torso-head restraint system to be used in the flight tests of the Model F4H-1 airplane. This study was concerned with the adequacy of the restraint offered by the system with respect to protection of the pilot during exposure to acceleration. Three specific acceleration patterns representing extreme conditions which might occur during the course of the flight tests were investigated. Also determined in the course of the study was the ability of subjects to operate the stick and rudder pedals, the aircraft drogue chute, and both ejection controls under these conditions of acceleration while using the torso-head restraint. Results indicated that to the degree that the conditions of flight of the F4H-1 were simulated in this study the pilot will be adequately restrained by this seat and restraint system and will be able to operate the stick control, rudder pedals, drogue chute control, and the ejection controls under actual flight conditions. (Author)

AD-257 375 Div. 1
(12 June 61) OTS price $1.10

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
EVALUATION OF THE TORSO-HEAD RESTRAINT SYSTEM AND THE INTEGRATED HARNESS RESTRAINT SYSTEM UNDER CONDITIONS OF ACCELERATION.
Final letter rept. 2 Apr 59, 3p, illus. (Rept. no. MA-82-2621)
(Proj. TED no. ADC AE 5209)
Unclassified report

DESCRIPTORS: Aircraft, *Safety harness, Flight testing, Flight simulator, Aircraft seats, Acceleration, Effectiveness, Ejection seats.

AD-257 382 Div. 1
(12 June 61) OTS price $4.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
THE ARRESTING CABLE POP-UP DEVICE,
by Frank N. Lucero. Apr 61, 45p. incl. illus. tables (Rept. no. AFFTC TR 61-17)
Unclassified report

DESCRIPTORS: *Arresting gear, Jet planes, Landing gear, Tests, Design.

The feasibility of the Arresting Cable Pop-Up Device to engage main landing gear assemblies or a small hook attached aft of the main gear was investigated. An F-84G, F-100A, and a B-47 aircraft were used. It was concluded that the pop-up device can be programmed to engage either the main landing gear of most jet aircraft (provided they are not carrying centerline or pylon mounted external stores) or a short hook attached to the underside of the fuselage behind the main gear. Aircraft main gear engagements were demonstrated with the F-100A up to 143 knots. Engagements of a hook attached aft of the main gear were demonstrated up to 164 knots. Aircraft damage on the F-84G and F-100A was limited to dents and superficial damage caused by the cable. The B-47 main gear engagement attempt resulted in extensive wheel door damage. (Author)

AD-257 384 Div. 1, 16
(12 June 61) OTS price $1.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
BIOMEDICAL MONITORING OF THE X-15 PROGRAM,
by Burt Rowen. May 61, 19p. incl. illus. (Rept. no. AFFTC TN 61-4)
Unclassified report

DESCRIPTORS: *Pressure suits, *Pilots, Medical examination, Pressure, Respiration, Body temperature, Electrocardiography, Oscillographs, Recording devices, Telemetering, Air to surface, Monitors, Instrumentation, *Physiology, Data, Measurement, Flight, *Aviation medicine, *Aviation safety, Rocket planes.

This document presents the progress made in biomedical monitoring of the X-15 program at Edwards Air Force Base. The in-flight and real-time systems used for on-board recording and air-to-ground telemetry are described. A quantitative analysis is presented with brief comments on the heart and respiratory rates in particular. From a review of the data and other available biomedical information, it appears that no physiological barrier to manned space flight exists. (Author)

AD-257 385 Div. 1, 7
(12 June 61) OTS price $4.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF THE YAC-1DH AIRPLANE.
9 May 61, 1v. incl. illus. table (Proj. no. ATB 4-11)
Unclassified report

DESCRIPTORS: *Transport planes, Canada, Flight testing, Arctic regions, Climatic factors, *Auxiliary power plants, Electrical equipment, Generators, Maintenance, Gas turbines, Airplane engines.

Tests were conducted to (1) determine the suitability of the YAC-1DH Caribou airplane for Army use under arctic winter conditions; (2) determine whether it has any deficiencies or shortcomings which should be corrected in the production models; and (3) determine the suitability of the T62-T-7 turbine auxiliary power unit (APU) as installed in the YAC-1DH. The YAC-1DH Caribou (test airplane) is a twin-engine, high-wing, utility transport-type airplane. Results indicate that the test airplane was satisfactory with respect to operating characteristics, flight and performance characteristics, tactical suitability, and maintenance at the temperatures encountered (32F through -35F). The T62-T-7 turbine was satisfactory as an APU and engine preheat unit. It was recommended that the YAC-1DH airplane be considered suitable for Army use after correction of the deficiencies and shortcomings which are noted.

AD-257 519 Div. 1, 28
(14 June 61) OTS price $1.10

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
COMPARATIVE EVALUATION OF A STANDARD FACE CURTAIN AND AN EXPERIMENTAL D-RING LOCATED ON THE SEAT FRONT AS MODES OF ACTUATING EJECTION DURING EXPOSURE TO ACCELERATION; LETTER REPORT CONCERNING,
by J. H. Hill and J. L. Brown. 5 May 58, 10p. incl. illus. (Rept. no. MA-3-3585)
(Proj. TED ADC AE-5205)
Unclassified report

DESCRIPTORS: Gondolas, *Ejection seats, Effectiveness, Learning, *Aptitude tests, Reaction time, Acceleration, Aircraft equipment, Ejection, Tests, Human engineering.

A comparative evaluation is presented of a standard face curtain and an experimental D-ring located on the seat front as modes of actuating ejection during exposure to acceleration. The results are presented graphically in two forms. The time measures for both the successful and the unsuccessful attempts to eject are considered together in one distribution. The harmonic mean reaction time (the time required to initiate the ejection procedure) and the harmonic mean action time (the time required to perform the ejection procedure) are presented for the two ejection controls under each orientation as a function of the G level. The action times, however, are consistently shorter for the D-ring for all the orientations of acceleration. It may be concluded that for ease of access during exposure to sustained accelerations in the orientations which were investigated, an ejection control located on the front of the ejection seat is superior to the standard face curtain.

AD-257 520 Div. 1, 28, 29
(14 June 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
PILOT'S ABILITY TO ACTUATE EJECTION CONTROLS; FINAL REPORT CONCERNING,
by J. H. Hill and M. G. Webb. Final rept. 5 Feb 59, 21p. incl. illus. (Rept. no. MA-8-952)
(Proj. TED ADC AE 5205(NM 15 01 12.3)
Unclassified report

DESCRIPTORS: *Ejection seats, *Pilots, Effectiveness, Acceleration, Control, Safety harness, Ejection, Learning, Aviation personnel, Gondolas, Flight clothing, *Pressure suits, Protective clothing, Human engineering, Tests, Aircraft equipment.

The purpose of this study was first to determine the effect of acceleration on a pilot's ability to actuate the ejection controls of two makes of ejection seats, the McDonnell-Stanley seat equipped with an experimental torso-head restraint system and the Martin-Baker G-5 seat with the integrated harness restraint system. It was also an objective of the study to determine the degree to which the Mark V exposure flight suit and Mark IV (Goodrich) and the AX-83 (Arrowhead) lightweight full pressure flight suit impeded a pilot in the actuation of the ejection controls when compared to his performance while wearing the summer flight suit. The results indicate that a pilot, under conditions of acceleration may not be able to reach either the face curtain or the D-ring. Any encumberences such as an exposure suit or a full pressure suit will decrease the probability of his successful ejection. Failure of the canopy to jettison upon operation of ejection control and the subsequent requirement for use of the emergency actuation control will further decrease this probability if he is wearing an inflated full pressure suit.

AD-257 571 Div. 1, 9
(14 June 61) OTS price $19.75

Vehicle Research Corp., Pasadena, Calif.
DEVELOPMENT OF METHODS FOR PREDICTING V/STOL AIRCRAFT CHARACTERISTICS,
by Scott Rethorst, W. W. Royce and others. Final rept. on Phase 2. 15 Dec 60, 1v. incl. illus. tables, 21 refs. (Rept. no. 7)
(Contract Nonr-309900)
Unclassified report

DESCRIPTORS: *Vertical take-off planes, Airplanes, Aerodynamics, Mathematical analysis, Mathematical analysis, Mathematical prediction, Aerodynamic configurations, Stability, *Load distribution, Airframes, *Short take-off planes, Convertible airplanes, Variable pitch propellers, Flight, Design, Aerial propellers, *Helicopters.

Analyses are developed which enable prediction of the performance characteristics of a generalized spectrum of V/STOL aircraft. The analyses also define optimum configurational features within this broad spectrum. A resolution to the conflict between the hovering and forward flight regimes is provided by the analysis. Both aerodynamic and structural weight aspects are investigated. These two basic factors are analyzed separately, and then combined to provide an integrated analysis as a basis for quantitative performance prediction. The analysis defines quantitatively the performance potential of any VTOL vehicle as a function of its geometry, operating conditions, and weight. This unique potential is charted to illustrate the various trade-offs in performance characteristics available to the operator. (Author)

AD-257 599 Div. 1, 9
(14 June 61) OTS price $3.60

Allison Div., General Motors Corp., Indianapolis, Ind.
FINAL DESIGN ANALYSES OF AF 205F-272. PART I. PROPELLER AT TIME OF FIRST RUN.
Rept. on Development of Propeller for T63-A-1 Turbine Engine. 31 Jan 61, 25p. incl. illus. tables (Engineering Department rept. no. 1943)
(Contract AF 33(600)39928, Proj. 3138)
(WADD TR 61-55, pt. 1) Unclassified report

DESCRIPTORS: *Aerial propellers, *Variable pitch propellers, Propeller blades, Design, *Aerodynamics, Stresses, Turbopropeller jet engines.

Design analyses, propeller description, structural analysis (including performance considerations), aerodynamic design analysis, and a weight breakdown of the AF 205F-272 propeller configuration at the time of the first run are presented. This report is intended to present information which will lend itself directly to the final design configuration of a controllable pitch propeller. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY.

AD-256 923 Div. 2
(5 June 61) OTS price $8.60

Air Weather Service, Scott Air Force Base, Ill.
CONCEPT AND USE OF CENTRALLY PREPARED WEATHER CHARTS.
28 Apr 61, 12p. incl. illus. tables (AWS Manual no. 105-55)
Unclassified report

DESCRIPTORS: *Meteorological charts, Computers, Meteorological data, Central recording systems, Facsimile transmission, *Weather forecasting, *Weather stations, *Meteorology.

The AWS policy is established and explained for optimum use of charts and related material produced by centralized weather facilities, and procedures for the use of such materials are described. The manual provides guidance for all forecasters, whether users or originators of centralized facility products, as well as for personnel concerned with supervision, support, and administration of forecasting activities. Additionally, the contents will serve as a text for OJT, seminars, and formal training. (Author)

AD-256 941 Div. 2, 25
(5 June 61) OTS price $8.10

Ionosphere Research Lab., Pennsylvania State U., University Park.
A STUDY OF THE CHANGES IN THE F-REGION DURING SEVERE MAGNETIC STORMS,
by Y. V. Somayajulu. Rept. on Ionospheric Research. 1 Mar 61, 84p. incl. illus. tables, 60 refs. (Scientific rept. no. 146)
(Contract AF 19(604)4563)
(AFCRL-460) Unclassified report

DESCRIPTORS: *Magnetic storms, *Ionospheric disturbances, Terrestrial magnetism, Ionosphere, Meteorological data.

A study is presented of the F-region changes associated with three severe magnetic storms during the IGY period. The h'-f data from Washington D.C., Panama, Talara and Huancayo Stations, which lie close to the 75 degree W meridian, are used and the corresponding N-h

profiles are derived using Budden's method. The N-h profiles are studied in terms of: (1) Storm changes in the N sub m F and h(.9N sub m F), (2) The total electron content up to 200 km and between 200-300 km, and (3) The vertical drift velocities during storms. The storm changes in N sub m F and h(.9N sub m F) indicate that large height deviations of the order of 200 km may occur during severe storms. The vertical drift velocities during storms computed from the experimental N-h profile data reveal upward drifts. These drifts produced by the disturbance fields are found to be of the same order as the quiet day drifts. It is found that the total electron content up to 200 km is relatively unaffected by storms and that the electron content between 200-300 km is decreased, at least during the first day of the storm in lower latitudes, by about 20-50%. The time sequence of the ionospheric events during storms is believed due to the hydromagnetic effects of the interaction between solar plasma and geomagnetic field. (Author)

AD-256 942 Div. 2, 25
(5 June 61) OTS price $2.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
ROCKET MEASUREMENTS OF F LAYER ELECTRON DENSITY AND THEIR INTERPRETATION,
by S. A. Bowhill. Rept. on Project Winds.
1 May 61, 24p. incl. tables (Scientific rept. no. 148)
(NSF Grant no. 14246)
Unclassified report

DESCRIPTORS: *Ionosphere, Sounding rockets, Measurement, *Electrons, Density, Heating, Atmosphere, Temperature, Experimental data, *Meteorological data, *Diffusion.

Solution of the continuity equation for ionospheric electron density including the effects of ambipolar diffusion, near the peak of the F layer, indicate that the width of the peak is determined by the atmospheric scale height at night, but is less during photoequilibrium conditions during the day. This conclusion is borne out by rocket electron density measurements. Evidence is found supporting measurements of diurnal atmospheric heating deduced from satellite drag data, and a thermopause temperature is found of about 1180 K at night and 1490 K during the day. Assuming the classical form for the ambipolar diffusion coefficient, a value of the loss coefficient Beta is found of about 0.0005/sec at 300 km height, which falls within the range measured by other methods. (Author)

AD-256 948 Div. 2
(5 June 61) OTS price $5.60

Naval Ordnance Test Station, China Lake, Calif.
A STUDY OF THE DEFLECTION OF THE VERTICAL AT THE U. S. NAVAL ORDNANCE TEST STATION,
by William F. McIntosh and Sheldon T. Rio.
2 Mar 61, 38p. incl. illus. tables (Rept. no. NOTS TP 2586)
(NAVWEPS rept. no. 7596) Unclassified report

DESCRIPTORS: Instrumentation, Ellipsoids, Deflection, *Gravity, *Geodetic data, Geodesics, Earth, Geodetic astronomy.

The problem of deflection of the vertical is presented and ways it is often solved are summarized. The gravimetric method is outlined and the details of its actual use are listed. The results of the preliminary gravimetric calculations made for 1 Midas location and 8 FLR stations are given. The proposed project to complete the deflection calculations gravimetrically and to determine the deflection at any other station in the Indian Wells Valley is outlined. Proposals for future extension and sophistication of the gravity project are included. A comparison is made between the gravimetric and astronomic-geodetic methods. (Author)

AD-257 068 Div. 2, 4, 16
(5 June 61) OTS price $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
HARBOR SCREENING TESTS OF MARINE BORER INHIBITORS - III. TYPE C,
by H. Hochman and T. Roe, Jr. 16 May 61, 36p. incl. tables (Technical rept. no. 147)
(Proj. Y-R005-07-007)
Unclassified report

DESCRIPTORS: *Marine borers, Control, Inhibition, Wood, Impregnation, Resistance, *Materials, Tests, Creosote, Inorganic substances, Metalorganic compounds, Organic compounds.

When impregnated into wood test panels, creosote, coal tar, 70-30 creosote-coal tar solution, tributyltin coconut fatty acid salt, and tributyltin oxide, in general, give protection against Martesia and teredine (Teredo) attack but not against Limnoria. Inorganic copper and mercury compounds, phenylmercuric oleate, dibenzofuran, fluorene, and toxaphene protect against Limnoria attack only. Resistance to Limnoria attack, without adversely affecting resistance to Martesia and Teredo, is increased by the addition to creosote of aluminum, copper, or manganese oxinates, and dieldrin, phenylmercuric chloride, or phenylmercuric oleate; by the addition to coal tar of copper naphthenate or phenyl-mercuric oleate; and by the addition to a 70-30 solution of creosote-coal tar of copper naphthenate, dieldrin, endrin, phenylmercuric chloride, or phenylmercuric oleate. Combinations of copper compounds or complexes plus oxine or polyvinylmethyl ether-maleic anhydride, and dieldrin or endrin plus malachite green oxalate are resistant to Limnoria and teredine borers but not to Martesia. (Author)

AD-257 071 Div. 2, 25
(5 June 61) OTS price $12.50

Liege U. (Belgium).
IDENTIFICATIONS IN THE SPECTRA OF AURORAE,
by L. Remy, C. Arpigny, and B. Rosen. Rept. on Research on Relations Between Cometary, Solar and Upper Atmospheric Physics. 21 May 60, 1v. incl. tables (Technical note no. 6)
(Contract AF 61(052)24)
(AFCRL TN 60-604) Unclassified report

DESCRIPTORS: *Aurorae, Carbon compounds, *Spectrographic analysis, Nitrogen compounds, Oxygen, Free radicals, Nitrogen, Oxides, Hydrides, *Molecular spectroscopy, *Atomic spectrum, Nitrides, Electron transitions.

A detailed critical discussion is presented of all possible atomic and molecular assignments in the spectra of polar aurorae. All spectra of NI, II; OI, II; (NI, II); (OI, II); N2; N2(+); O2; O2(+); NO; NH; CH; CO; CO(+); CN and OH have

been discussed using the best laboratory - and theoretical data available. While the previous general views have been confirmed, much detailed information is provided and uncertainties are lifted. (Author)

AD-257 096 Div. 2, 6
(5 June 61) OTS price $2.60

Manchester U. (Gt. Brit.).
METEOR TRAIL MEASUREMENTS BY RADIO ECHO DETECTION MEANS.
Final technical rept. 1 May 56-31 Oct 58, 31 Oct 58, 1v. incl. illus.
(Contract AF 61(514)948)
(AFCRC TR 59-241) Unclassified report

DESCRIPTORS: Upper atmosphere, Density, *Meteors, Reflection, *Radio waves, Measurement, Ionization, Molecular spectroscopy, Atmospheric refraction, *Radio astronomy, *Meteorological data, Temperature, Determination, Great Britain, Diurnal variations.

Research was concerned with the measurement of upper atmospheric densities and scale heights from the radio echo observations of meteor trails. From measurement of the mean heights at which meteors of different velocity burn away, the air density can be determined. The widths of the height distributions for meteors in homogeneous velocity groups also give the scale height. The theory of meteor evaporation is found to break down for velocities less than 30 km/sec, and this method can only be applied to meteors with velocities between 30 and 70 km/sec, which ionize between heights of 90 and 100km. Densities and scale heights can also be determined by measurements of the molecular diffusion coefficient in the height range 85 to 100km, diffusion coefficient being given by observation of the radio echo duration. Some measurements of density and scale height are presented, and in particular the diurnal variation of atmospheric density is discussed. (Author)

AD-257 099 Div. 2, 25
(5 June 61) OTS price $2.60

Liege U. (Belgium).
IONIZATION AND EXCITATION OF NEUTRAL OXYGEN IN THE VICINITY OF HOT STARS,
by L. Houziaux. 10 Sep 60, 25p, incl. illus. tables (Technical note no. 8)
(Contract AF 61(052)24)
(AFCRL TN 60-826) Unclassified report

DESCRIPTORS: *Ionization, *Excitation, *Oxygen, *Stars, Atmosphere, Astrophysics, Thermodynamics, Atoms, Space environmental conditions, Astronomy.

Relative populations of excited and ionized levels of oxygen are computed. The investigated system includes a B2V star surrounded by a spherical envelope, located at a distance of three stellar radii from the center of the star. The envelope is opaque to the Lyman continuum and lines, but is transparent in the Balmer continuum. Following transitions have been considered: radiative transitions between discrete levels, photoionizations, collisional excitations and ionizations, and recombinations. (Author)

AD-257 106 Div. 2
(12 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
VARIATION OF COSMIC RAY INTENSITY ASSOCIATED WITH SOLAR ACTIVITY (Izmeneniya Intensivnosti Kosmicheskikh Luchey, Svyazannyye S Deyatel'Nost' Yu Solntsa),
by A. I. Oli'. Oct 60. 11p. incl. illus. table. (Trans. no. MCL-66 from Priroda (Periodical) 40: 48-52, 1951)
Unclassified report

DESCRIPTORS: *Cosmic rays, Intensity, *Solar disturbances, Magnetic storms, Ionization, Sun.

The relationship existing between cosmic ray intensity (I) and the active processes on the sun is investigated. The changes of the I value are of dual character: They are, first, the shortlasting increase of I, and, second, the more prolonged diminishing of I, frequently observed during magnetic storms. The investigation considers the increase of I, aided by a large amount of new observational data collected in recent years. (Author)

AD-257 107 Div. 2
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE CHANGE IN THE ROTATION OF THE SUN CAUSED BY MATTER FALLING INTO THE SUN UNDER THE POYNTING-ROBERTSON EFFECT (Izmeneniye Vrashcheniya Solntsa V Rezul'tate Vypadeniya na Nego Veshchestva Pod Deystviyem Effekta Poyntynga-Robertsona),
by V. S. Safronov. Oct 60. 9p. incl. tables. (Trans. no. MCL-78 from Academician O. Yu. Shmidt, 7 July 1955)
Unclassified report

DESCRIPTORS: *Sun, *Rotation, *Celestial mechanics, *Interstellar matter, Theory, Solar atmosphere.

The falling of substance from a protoplanet cloud into the sun as a result of the Poynting-Robertson effect was considered as one of the possible reasons for the origin of the sun's rotation. This work will present the quantitative evaluation of the possible role of this effect. (Author)

AD-257 108 Div. 2, 24
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PHOTOMETRY OF IMAGES OF THE CORONA IN LINE LAMBDA 5303 ANGSTROMS (Fotometriya Izobrazheniy Korony V Linii Lambda 5303 Angstroms),
by P. N. Polupan. Jan 61, 4p. incl. illus. table (Trans. no. MCL-84 from Astronomicheskiy Tsirkulyar 141:5-8, 1953)
Unclassified report

DESCRIPTORS: Astronomy, *Solar corona, Solar eclipse, *Astronomical cameras, *Sun, Intensity, Chile, *Solar spectrum.

These results of an investigation of images of the corona in the green line were obtained by an expeditionary force of the Astronomical Observatory of Kiev State University in Chili in February, 1952, while observing a full solar eclipse. The observations were made with a

5-meter prismatic camera. The images of the corona in Lambda 5303 Angstroms were subjected to detailed photometric interpretation on two plates at positional angles 283 degrees - 333 degrees (computed from the pole of the sun). The method of T. V. Krat was used to separate the monochromatic coronal luminosity from the overall luminosity, consisting of the luminosity of the corona and dispersed light in earth's atmosphere and in the instrument. (Author)

AD-257 115 Div. 2
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ROTATION OF THE SUN (Vrashcheniye Solntsa),
by A. I. Lebedinskiy. 18 Oct 60. 27p. (Trans. no. MCL-310 from Astronomicheskiy Zhurnal 18: 10-25, 1941)
Unclassified report

DESCRIPTORS: *Sun, Rotation, Velocity, *Celestial mechanics, Sunspots, Convection, USSR.

The problem of the rotation of the sun is considered, proceeding from the assumption that the sun is stationary and affected by turbulent friction forces. The basic equation is deduced, and it is explained that a stationary sphere of gas, when influenced by turbulent friction forces, generally speaking, does not rotate as a solid body. The general integral of the equation deduced is obtained. The angular rotational velocity of the sun, as a function of the heliographic latitude and the distance from the center of the sun, is found under differing assumptions concerning the relation of the coefficient of turbulent friction to the center of the sun. All the solutions obtained agree with the observed relationship between the angular rotational velocity and the latitude. The solutions obtained are studied from the point of view of their dynamic possibilities, and the problem of the rotation of the sun is stated in a general way. (Author)

AD-257 125 Div. 2, 1, 30
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TRANSACTIONS OF THE CENTRAL AEROLOGICAL OBSERVATORY (SELECTED ARTICLES).
24 Oct 60, 29p. incl. illus. table (Trans. no. MCL-395 from Trudy Tsentral'noy Aerologicheskoy Observatorii 22: 3-16, 1957)
Unclassified report

DESCRIPTORS: *Meteorology, *Meteorological instruments, *Air mass analysis, USSR, Instrumentation, Meteorological data, Aircraft, Atmosphere, Climatic factors, Physical properties.

Contents:
Electric meteorograph for aircraft research
Determination of vertical velocities of turbulent gusts of wind during observation flights of airplanes

AD-257 156 Div. 2, 25
(2 June 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SEVERAL GENERAL METHODS OF QUALITATIVE STUDY OF THE FORMS OF MOTION IN PROBLEMS OF CELESTIAL MECHANICS (O Nekotorykh Obshchikh Metodakh Kachestvennogo Form Dvizheniya V Problemakh Nebesnoy Mekhaniki)
by N. Moiseyev. Oct 60, 39p. (Trans. no. MCL-655 from Trudy Gosudarstvennogo Astronomicheskogo Instituta)
Unclassified report

DESCRIPTORS: *Celestial mechanics, Motion, Differential equations, *Dynamics, Stability. Mathematical analysis.

In the preceding investigation (Trudy Gaish, Proc. of the State Astronomical Inst., Vol. IX, No. 2, 1939) methods were considered of constructing regions of continuous stability and instability in Lyapunov's sense in phase space for a certain dynamic problem. Simultaneously, considerable attention was devoted to consideration of the problem of construction of the regions of transverse and longitudinal stability. However, this treatment was only carried out for the particular case of a two- and a three-dimensional phase space. The purpose of the present work is to present the results of investigation of the characteristics of a longitudinal and transverse stability in the general case of an n-dimensional phase space. The equations of motion are assumed not to contain the time t explicitly. (Author)

AD-257 160 Div. 2, 25
(2 June 61) OTS price $15.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PHYSICS OF THE INTERSTELLAR MEDIUM (Fizika Mezhzvezdnoy Sredy)
by S. V. Pikel'ner. Dec 60, 224p. incl. illus. (Trans. no. MCL-661 from Izdatel'stvo Akademii Nauk SSSR, Moskva, 1959)
Unclassified report

DESCRIPTORS: *Astronomy, *Interstellar matter, *Stars, Galaxies, Light, USSR, Spectrographic analysis, *Astrophysics, Nebular, Planets.

Contents:
Introduction
Planetary nebulae
Diffuse nebulae
The interstellar gas
Magnetic fields in the galaxy
The interstellar medium-stage for evolution of matter in the galaxies

AD-257 169 Div. 2, 20, 25
(2 June 61) OTS price $9.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONTEMPORARY STATUS OF THE PROBLEM CONCERNING THE ORIGIN OF COSMIC RAYS (Sovremennoye Sostoyaniye Voprosa O Proiskhozdenii Kosmicheskikh Luchey)
by V. I. Ginzburg and S. I. Syrovatskiy. 5 May 61, 117p. incl. illus. tables (Trans. no. MCL-943 from Fizicheskiy Institut im. P. N. Lebedev, Akad Nauk SSSR, Teoreticheskiy Otdel, 122p. 1960)
Unclassified report

DESCRIPTORS: *Cosmic rays, *Radio astronomy, Galaxies, *Astrophysics, Supernovae, USSR, Magnetic fields, Chemical analysis, Particles, Astronomy, Sources.

Contents:
Primary cosmic rays near the earth
Radioastronomic data
Lifetime of cosmic rays and nature of their motion in galaxy and metagalaxy
Sources of cosmic rays. Mechanism of acceleration and chemical composition of cosmic rays

AD-257 173 Div. 2, 8, 25
(6 June 61) OTS price $4.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
IONOSPHERIC RESEARCH,
by A. J. Ferraro. Final rept., 1 Apr 58-31 Mar 61. 30 Apr 61. 38p. 55 refs.
(Contract AF 19(604)3875)
(AFCRL-477) Unclassified report

DESCRIPTORS: *Ionosphere, *Electrons, Density, *Radio waves, Propagation, Low frequency, Very low frequency, Solar flares, Bibliography, Recombination reactions, Polarization.

Contents:
Introduction
Scientific objectives
A brief history of the project
Investigations undertaken
Investigations active since April 1958
Physics of the D and E regions
Low frequency sweep group height
Long wave polarization experiment
Low frequency instrumentation and design
Low frequency sweep analysis
Conclusions
Reports and papers published and presented
Reports issued
Scientific reports in preparation
Published papers
Papers presented at Scientific Meetings
Papers accepted for publication

AD-257 192 Div. 2, 16
(7 June 61) OTS price $9.10

Texas A. and M. Coll., College Station.
DISTRIBUTION OF FORAMINIFERA IN THE BARRIER REEF AND LAGOON OF BRITISH HONDURAS,
by Donald E. Cebulski. May 61. 98p. incl. illus. tables. (Ref. no. 61-13T)
(Contract N7onr-48702; Proj. NR 083-036)
Unclassified report

DESCRIPTORS: *Oceanography, *Marine biology, Honduras, Coral reefs, Sedimentation, Ocean bottom, Great Britain.

Eighty-nine sediment samples were collected from the barrier reef and lagoon of British Honduras. Forty-one bottom water samples were also collected for determining temperature and salinity. Living and total (living and dead) foraminiferal populations were determined in each of the sediment samples. Analysis of the sediment samples indicates that the sediments on the barrier reef were calcarenites or calcilutites while in the lagoon they were silts and/or clays, often with admixtures of sand or shell material. The largest living and total foraminiferal populations were found to occur on the leeward side of mangrove and coralsand cays on the barrier reef and near the effluents of certain rivers in the lagoon. The smallest living and total populations on the barrier reef were found in areas geographically remote from mangrove or coralsand cays. In the lagoon the smallest living populations occurred close to the barrier reef while the smallest total populations, excluding those situated close to the effluents of certain rivers, were found close to the mainland. Two distinct foraminiferal faunas were recognized from the living populations, one characteristic of the barrier reef and the other of the lagoon. On the basis of scatter diagrams a fauna transitional between the barrier reef and lagoon faunas was delineated. (Author)

AD-257 298 Div. 2
(9 June 61) OTS price $3.60

McGill U. (Canada).
STUDIES IN ARCTIC AND STRATOSPHERIC METEOROLOGY,
by F. Kenneth Hare and B. W. Boville. Final rept. Apr 61, 35p. incl. illus. tables (Arctic Meteorology Research Group Publication in Meteorology no. 42)
(Contract AF 19(604)3865)
(AFCRL 416) Unclassified report

DESCRIPTORS: *Stratosphere, *Wind, Meteorological charts, Climatic factors, Energy, Temperature charts, Tables, Northern hemisphere, Arctic regions.

Research was conducted with regard to the structure and energetics of the polar-night westerlies. The 80 degree W cross sections to the 35-km level and the hemispheric charts to the 25-mb level reveal a circumpolar stratospheric system which is characteristically eccentric and bi-polar. These are features related to tropospheric activity. Energies and transports computed by geostrophic Fourier techniques are presented. Perturbations involving conversions usually associated with baroclinic wave activity were identified in wave numbers one to four. Ozone concentrations are shown to be influenced by this wave activity. A brief review is also given of certain climatological studies. (Author)

AD-257 344 Div. 2
(8 June 61) OTS price $9.10

Madrid U. (Spain).
STUDY OF THE SOILS OF THE EBRO VALLEY. II. PROVINCES OF HUESCA AND ZARAGOZA,
by J. M. Albareda, A. Guerra, and F. Monturiol. Final technical rept. 1 Apr 60-30 Mar 61. 30 Mar 61, 105p. incl. illus. tables.
(Contract DA 91-591-EUC-1424)
Unclassified report

DESCRIPTORS: *Soils, Terrain, Identification, Classification, Minerals, Tables, Maps, Spain.

This analysis includes the study of the soils of the provinces of Huesca and Zaragoza with a total extension of 8,200,000 acres corresponding to 3,300,000 Hectares. The main part of the analysis concerns the drawing of soil maps of these provinces at a scale 1:250,000 and the complementary part deals with the laboratory study of the samples of soils and the wording of the explicatory report. (Author)

Division 2-ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-257 347 Div. 2
(9 June 61) OTS price $16.00

Florida State U., Tallahassee.
TEN- AND NINETY-PERCENTILE WIND PROFILES FOR TWENTY NORTHERN HEMISPHERE STATIONS,
by Thomas A. Gleeson. Appendix to Final rept. 28 Feb 61, 237p. tables.
(Contract AF 19(604)4986)
(App. to AFCRL-297, AD-255 469)
Unclassified report

DESCRIPTORS: *Wind, *Weather stations, Northern Hemisphere, Tables, Cloud height indicators, Digital computers, Statistical data.

AD-257 386 Div. 2, 25
(5 June 61) OTS price $2.60

Oslo U. (Norway).
STUDIES IN AURORAL SPECTROSCOPY, AND OF THE RAPID FLUCTUATIONS IN THE GEOMAGNETIC FIELD DURING DISTURBANCES.
Final technical rept. 15 Dec 56-15 Dec 59. 15 Jan 60, 22p. incl. illus. table.
(Contract AF 61(514)1123)
(AFCRC TR 60-256) Unclassified report

DESCRIPTORS: *Aurorae, *Terrestrial magnetism, Magnetic storms, Recording devices, Measurement, Phototheodolites, Spectrophotometers, Interferometers, Luminescence, Intensity, *Spectrographic data, Norway.

Studies and experimental investigations were directed toward determination of the rapid fluctuations in the strong auroral spectral lines. The mean lifetimes of auroral emission and the deactivation occurring through collisions were studied. The relative displacement of the fluctuations in different spectral lines of aurorae lying at different heights, which would indicate the influence of varying pressure and temperature, was investigated. Where possible, comparisons were made of the auroral phenomena studied and other geophysical or solar features appearing simultaneously. This work included the adoption and operation of a chopping photometer for the special requirements of the foregoing research. Photoelectric studies were conducted on the luminosity distribution within auroral forms, with special attention given to the intensity distribution of the hydrogen lines. An investigation was made of the amplitude and frequency distribution of rapid variations in the geomagnetic field during auroral displays. Observations were attempted on possible very low frequency electromagnetic radiation from aurorae or from extraterrestrial sources close to the earth. (Author)

AD-257 430 Div. 2
(12 June 61) OTS price $4.60

Intermountain Weather, Inc., Salt Lake City, Utah.
A METHOD OF ESTIMATING INSOLATION LOSS DUE TO SOIL MOISTURE,
by J. Vern Hales and Roger R. LeClair. Mar 61, 35p. incl. illus. tables (Scientific rept. no. 1)
(Contract AF 19(604)7333)
(AFCRL-405) Unclassified report

DESCRIPTORS: *Soils, Moisture, *Evapotranspiration, Air, Heat transfer, Evaporation, Tables, Mathematical analysis.

Of the total insolation reaching the top of the atmosphere, less than half heats the air. The insolation is first reduced by the sky and cloud albedo, then is further reduced by the ground albedo. The remaining portion is reduced by the evapo-transpiration process. The insolation loss due to the evapo-transpiration process is a function of soil moisture, soil type and vegetation. The maximum loss occurs when the soil is saturated and decreases to the minimum value when the soil reaches its driest state. An estimation of the insolation loss due to soil moisture as a function of time is determined by statistical methods. (Author)

AD-257 431 Div. 2
(12 June 61) OTS price $4.60

Intermountain Weather, Inc., Salt Lake City, Utah.
THE USE OF INSOLATION IN FORECASTING THE DISSIPATION OF SUMMER STRATUS AT BURBANK, CALIFORNIA,
by J. Vern Hales and Dean Hayes Frey. Mar 61, 37p. incl. illus. tables. (Scientific rept. no. 2)
(Contract AF 19(604)7333)
(AFCRL-432) Unclassified report

DESCRIPTORS: *Weather forecasting, *Stratus clouds, Reduction, Energy, Heating, Distribution, *Heat transfer, Meteorological data, California.

Forecasts of the breaking time of stratus were made for Burbank, California. The forecasts were based upon an estimate of the efficiency of insolation in heating the cloud layer above its saturation temperature, while a skew T- log p diagram was used to determine the amount of energy needed. The average error of the forecasts was twenty-nine minutes using pilot reports and sixty-nine minutes using Santa Monica radiosonde reports. (Author)

AD-257 529 Div. 2, 20
(19 June 61) OTS price $7.60

Isotopes, Inc., Westwood, N. J.
MIXING AND TRANSFER WITHIN THE STRATOSPHERE,
by Herbert W. Feely and Jerome Spar. 31 Dec 60, 74p. incl. illus. table.
(Contract DA 29-044-XZ-609)
(DASA-1222) Unclassified report

DESCRIPTORS: *Stratosphere, Sampling, Airborne, *Particles, Distribution, Mixtures, *Radioactive isotopes, Collecting methods, Abundance, Aircraft.

Preliminary data on Phases 4 and 5 of Crowflight are given. The recalibrated U-2 duct curves are given. Tritium and Carbon-14 concentrations in New Jersey rain and air samples during 1959 and 1960 respectively are reported. The manner of mixing and transfer of Strontium-90 in the stratosphere is described. The seasonal increase in mixing from the tropical to polar regions is noted. Tungsten-185 distributions are discussed. Measurements of Rhodium-102 indicate that Teak and Orange debris has entered the lower stratosphere. A mean residence time of less than 10 years for this debris is suggested. Concentrations of Beryllium-7, a cosmic-ray product, are reported. Strontium-89 and Cerium-144 data is discussed in the light of the HASP mixing model. The size distribution and composition of stratospheric particles collected on electron microscope probes exposed in the stratosphere is described. Particles in the size range 0.1 to 1.5 microns appear to be composed of ammonium persulphate. A stratospheric inventory of 5.7 x 10 to the 7th power Kg of SO4 is deduced. (Author)

AD-257 564 Div. 2, 30
(13 June 61) OTS price $3.60

Massachusetts Inst. of Tech., Cambridge.
MEASUREMENT OF DROP SIZE DISTRIBUTION AND LIQUID WATER CONTENT IN NATURAL CLOUDS,
by D. P. Keily. Final rept. for 1 Jan 58-31 July 60. 31 July 60, 12p. illus. table.
(Contract AF 19(604)3050)
(AFCRL-491) Unclassified report

DESCRIPTORS: *Clouds, *Moisture, Drops, Measurement, Collecting methods, Moisture meters, *Meteorological instruments, Flight testing, Instrumentation.

A previously developed electric cloud drop probe was reconstructed and extensively flown in a private aircraft. In an almost routine manner, large quantities of cloud observations were made which verify the previously claimed capability of the system to measure water drops in the size range three to sixty microns diameter. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-257 336 Div. 3, 16
(8 June 61) OTS price $5.60

Dugway Proving Ground, Utah.
THE INDIGENOUS BACTERIAL AND MYCOTIC FLORA OF THE AIR AND ITS INFLUENCE ON THE DETECTION OF BW AEROSOLS,
by J. N. Adams, D. Seidler and others. Feb 61, 58p. incl. illus. tables, 22 refs (Technical rept. no. DPGR 279)
Unclassified report

DESCRIPTORS: *Bacteria, *Biological warfare agents, *Bacterial aerosols, Culture media, Fungi, Growth, Collecting methods, Identification.

Six cities having different general climates were visited once during each of three seasons in the year 1958, in order to determine the levels and types of bacteria and fungi present in the atmosphere. The cities were Seattle, Washington; San Bernardino, California; Salt Lake City, Utah; East St. Louis, Illinois; Jacksonville, Florida; and Philadelphia, Pennsylvania. Differences in recovery attributable to location, time, and season were observed. For example, the numbers of viable particles (particles containing at least one viable cell) collected at Salt Lake City were low, while the recoveries at Jacksonville were high. Two major problems were (1) the overcrowding of the plates, especially with fungi, and (2) the logistics of sampling. These difficulties were overcome by decreasing the number of stages in the sampler, by reducing the number of media to be used, by shortening the sampling interval, and/or by adding specific inhibitors (i.e., actidione, penicillin, and potassium tellurite) to the media. In spite of these procedures, usable data were obtained only from the collections made on the sixth stage of the modified sampler. (Author)

4. CHEMISTRY

AD-257 019 Div. 4
(7 June 61) OTS price $2.60

New York U., Coll. of Engineering, N. Y.
THE THERMAL DECOMPOSITION OF ALUMINUM TRIETHYL,
by Yuji A. Tajima, George Salser, and Charles J. Marsel. Technical note. Feb 61, 21p. incl. illus. tables, 12 refs.
(Contract AF 49(638)173)
(AFOSR-553) Unclassified report

DESCRIPTORS: *Aluminum compounds, Ethyl radicals, *Metalorganic compounds, *Pyrolysis, Decomposition, Chemical reactions, Reaction kinetics, Ignition, Surface properties, Hydrolysis, Ethylenes, Butenes, Molecular isomerism, Vapors, Polymers.

An investigation of the pyrolysis of triethyl aluminum (TEA) was undertaken preliminary to a study of the kinetic mechanism involved in its ignition. The thermal decomposition reactions were homogeneous. The main decomposition products were H, butenes, ethylene, and Al. Ethane was a minor product. Polyethylene, traces of methane and propylene sometimes appeared. The mechanism was molecular. (Author)

AD-257 020 Div. 4, 16
(6 June 61) OTS price $1.10

Kentucky U., Lexington.
ANTI-RADIATION DRUGS DERIVED FROM SULFINAMIDES AND N-SULFINYLAMINES,
by Walter T. Smith, Jr. Final technical rept. 1 Feb 60-1 June 61. 1 June 61, 4p.
(Contract DA 49-193-md-2054)
Unclassified report

DESCRIPTORS: *Sulfinyl radicals, *Amides, *Amines, *Hydrazine derivatives, Thiols, *Radiation injuries, *Control, Preventive medicine, Preparation, Synthesis, Benzenes, Countermeasures, Drugs, Radiation effects, Hydrazines.

The possible preparation of N-sulfinyl derivatives of 2-aminoethanethiol and p-aminobenzenethiol by reaction of bis-(aminoethyl)disulfide and bis-(4-aminophenyl)-disulfide with thionyl chloride under a variety of conditions has been studied. The reaction of N-(2-chloroethyl)-benzenesulfinamide and N-(3-chloropropyl)-benzenesulfinamide with reagents which usually convert halides to thiols gave no N-(mercaptoalkyl)-benzenesulfinamide. Various methods for the preparation of hydrazinothiols have been studied. A promising sequence is $HSCH_2CO_2CH_3$ yields $HSCH_2CON(CH_3)NH_2$ yields $HSCH_2CH_2N(CH_3)NH_2$. (Author)

Division 4- CHEMISTRY

AD-257 033 Div. 4, 10
(8 June 61) OTS price $2.60

Florida U. Engineering and Industrial Experiment Station, Gainesville.
THE PREPARATION OF FLUORINE-CONTAINING COMPOUNDS,
by Henry C. Brown. Terminal rept. 1961, 22p. incl. illus. tables.
(Contract Nonr-58003; Proj. NR 356-333)
Unclassified report

DESCRIPTORS: *Fluorides, *Fluorocarbons, Amines, Amides, Hydrazines, Nitriles, Pyridines, Pyrroles, Alkyl radicals, Propenes, Acetylenes, Thio radicals, Sulfur compounds, Heterocyclic compounds, Polymers, Polymerization, Stability, Synthesis, Chemical reactions, Condensation reactions, Triazines, Azoles.

Research was concerned with the synthesis of high molecular weight, thermally stable materials resistant to chemical action. The most promising reaction was the condensation of perfluoroalkyl amidines to form triazines. Other reactions discussed include: (1) the addition of N2H4 to perfluoroalkyl nitriles with production of perfluoroalkyl hydrazidines and 2,5 bis(perfluoroalkyl)1-N-amino-1,3,5-triazoles; (2) the reaction of perfluoropropene with S to form the 1,4 dithane ring; (3) dimerization, trimerization and polymerization of unsaturated fluorocarbons; (4) synthesis of perfluoroalkyl and perfluoroalkene substituted triazines; and (5) preparation of the perfluoroalkyl substituted 1,3,4, oxadiazole structure.

AD-257 075 Div. 4, 25
(6 June 61) OTS price $1.60

Washington U., Seattle.
PRIMARY PROCESSES IN Hg (3P1) PHOTOSENSITIZED REACTION OF CYCLOPROPANE.
by D. W. Setser, B. S. Rabinovitch, and E. G. Spittler. 20 May 61, 13p. table, 22 refs.
(Technical rept. no. 6)
(Contract Nonr-47714, Proj. NR 051-217)
Unclassified report

DESCRIPTORS: Mercury, *Propanes, Mercury lamps, *Photochemical reactions, Isomer, *Photochemistry, *Polymerization, Polymers, Methyl radicals, Monocyclic compounds, Deuterium, *Photosensitivity, Atomic energy levels, Excitation, Reaction kinetics, Exchange reactions, Temperature, Pressure, Vapors, Spectrographic analysis, Propenes, Chemical reactions, Polycyclic compounds.

Cis-trans isomerization is apparently of general occurrence in Hg(3P1) photosensitization of substituted cyclopropanes. An important primary process in the quenching of Hg(3P1) atoms by cyclopropane-d sub 2 seems to be the formation of triplet cyclopropane. Some exchange occurs at higher temperature. The Hg(3P1) photosensitized polymerization and exchange of deuterium sub 2 mixtures with cyclopropane also proceeds readily at elevated temperature (135 C). (Author)

AD-257 080 Div. 4
(7 June 61) OTS price $3.60

Wisconsin U., Madison.
THE EFFECT OF MOLECULAR STRUCTURE ON CATALYSIS AND MOLECULAR BINDING,
by T. Higuchi. Progress rept. nos. 4-5, Mar-Dec 60. 1 Mar 61, 33p. incl. illus. tables, 12 refs.
(Contract DA 18-108-405-cml-265).
Unclassified report

DESCRIPTORS: *Catalysis, *Complex compounds, *Phosphorous compounds, *Phenols, Esters, Molecular structure, Hydrolysis, Acids, Organic compounds, Reaction kinetics, Hydroxides, Synthesis, Chemical bonds, Enzymes, Benzenes, Methyl radicals, Propyl radicals, Chemical reactions, Phosphine oxides, Cyclohexanols, Chlorides, Antibiotics, Carboxylic acids, Catalysts, Cyclohexanes.

In the studies related to the catechol-Sarin reaction, the pH profile of the rate of hydrolytic cleavage of the reaction products has been experimentally determined over the entire pH range above four. Possible mechanisms consistent with these observations are presented. Rates of hydrolysis of a series of phenolate phosphonate analogues of Sarin were determined. Data are given for p-nitro, p-methoxy, and p-chloro esters as well as the simple phenyl ester. All systems exhibited first order dependency on OH(-). Apparent heats of activation and entropy data have been obtained. Further data are reported on the remarkable catalytic activity of trans-cyclohexane 1,2-dicarboxylic acid on the hydrolysis of chloramphenicol. (Author)

AD-257 127 Div. 4, 14
(5 June 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE VIII MENDELEEV CONGRESS AND POLYMER SCIENCE IN THE USSR (VII Mendeleevskiy S'Ezd I Otechestvennaya Polimernaya Nauka),
by G. L. Slonimskiy and P. V. Kozlov. 27 Oct 60. 50p. (Trans. no. MCL-435 from Vysokomolekulyarnye Soedineniya 1:1112-1125, July 59)
Unclassified report

DESCRIPTORS: *Polymers, Plastics, *Conferences, Chemistry, Reaction kinetics, Chemical reactions, Polymerization, Synthesis, Recombination reactions, Synthetic fibers, Resins, USSR, Synthetic rubber, Cellulose chemistry, Cellulose esters, Biochemistry, Rubber.

The section of the VIII Mendeleev Congress on the chemistry and technology of polymers is discussed. The reports presented were concerned primarily with the synthesis of new types of polymers, the development of new methods of synthesis, and the modifications of the properties of polymers. Some of the compounds studied were: (1) urethane polyesters, (2) linear polymers such as polydiisopropyl benzene, (3) copolymers from the unsaturated ester--unsaturated acid--salt of unsaturated acid system, (4) weak-acid ion-exchange resins, (5) salts of acrylic and methacrific acids, (6) grafted copolymers, (7) polyorganoalumosiloxanes, (8) organometallic chelate-forming compounds, (9) isoprene and butadiene polymers, (10) silicon-stannic organic and stannic-organic compounds, (11) fiber-forming polymers, (12) diamines, (13) grafted copolymers of styrol and starch, (14) vinyl polymers, and (15) rubber. A number of papers were dedicated to the synthesis of cellulose derivatives, to the study of the properties of cellulose and other polysaccharides, and to their utilization as raw materials.

AD-257 128 Div. 4
(5 June 61) OTS price $7.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SILANOLS (Silanoly),
by M. F. Shostakovskiy, N. V. Komarov and others. 17 Jan 61. 74p. incl. tables, 112 refs. (Trans. no. MCL-437 from Uspekhi Khimii 28:741-771, 1959)

Unclassified report

DESCRIPTORS: *Silanes, *Alcohols, USSR, Hydroxides, *Metalorganic compounds, Synthesis, Chemical properties, Separation, Physical properties, *Bibliography, *Silicon compounds, Chemical reactions, Hydrolysis, Hydrogenation.

The synthesis and properties of silanols compounds containing OH groups directly connected to the Si atom are described. In view of the affinity of the Si atom to O there are organosilicon compounds containing 1, 2, and 3 OH groups connected to the Si atom. These compounds are subdivided into alkyl(aryl)-silanols expressed by the general formula R3SiOH; disilanols R2SI(OH)2; and trisilanols RSi(OH)3. Of the above mentioned compounds, trialkyl (aryl) silanols have been studied the most. The latter are highly reactive compounds of great practical and theoretical significance. (Author)

AD-257 140 Div. 4
(2 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF THE ADDITION REACTION BETWEEN TRIALKOXYSILANES AND OLEFINS (Izucheniye Reaktsii Prisoyedineniya Trialkoksisilanov K. Olefinam),
by M. S. Nametkin, A. V. Topchiyev and others. Oct 60. 6p. incl. tables. (Trans. no. MCL-553 from Doklady Akademii Nauk SSSR 126:794-797, 1959)

Unclassified report

DESCRIPTORS: *Chemical reactions, *Silanes, Alkoxy radicals, *Ethylenes, Chemical properties, USSR, Alcohols, Alkyl radicals, Decenes.

The addition of trialkoxysilanes to olefins was demonstrated by interacting triethoxysilane, triisopropoxysilane, tributoxysilane, tri-(sec-butoxy)-silane, and tri(tert-butoxy)silane with 1-nonene and 1-decene in the presence of chloroplatinic acid and platinized charcoal. In the presence of chloroplatinic acid a yield of 30 to 40% was obtained. The addition of tri(tert-butoxy)silane, due to steric hindrance, gave the lowest yields of all (12%). Decyltributoxysilane and nonyltriisopropoxysilane were also obtained by direct synthesis, by the reaction of nonyltrichlorosilane and decyltrichlorosilane with the corresponding alcohols. The physicochemical properties of the alkyl-trialkoxysilanes obtained by both methods, addition to olefins and reaction with alcohols, were identical.

AD-257 148 Div. 4
(2 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
IONIZATION AND DISSOCIATION OF MOLECULES OF n-OCTANE AND n-NONANE BY MONOENERGETIC ELECTRONS (Ionizatsiya I Dissotsiatsiya Molekul n-Octane I n-Nonana Monoehergeticheskimi Elektronami),
by V. K. Potapov, V. G. Vasil'yev, and N. N. Tunitskiy. Oct 60. 7p. incl. illus. tables, 10 refs. (Trans. no. MCL-587 from Doklady Akademii Nauk SSSR; Izdatel'Stvo Akademii Nauk SSSR 126:612-615, 1959)

Unclassified report

DESCRIPTORS: *Octanes, *Molecules, *Ionization, *Dissociation, Electrons, USSR, Electron bombardment, Mass spectroscopy, Mass spectrometers, Chemical bonds, *Ionization potentials, Ions.

A study was made of the processes of fragmention formation and of molecular-ion excitation on electron impact by the aid of monokinetic electrons. The ionization curves of fragment ions and molecular ions of octane, octane-2D sub 1 and nonane-5C-13 were investigated by means of a specially designed mass spectrometer. A secondary-electron multiplier was used to measure the small ionic currents of the order of 10 to the -17th power amp. The ionization potential of the molecular ion C8H18(+) was 10.3 ev in comparison with the calculated value of 10.26 ev. The ionization potential of C sub n H sub (n+1)(+) ions corresponded to the formation of an ion and a radical. The potentials of the ion C3H7(+) from octane and of C3H6D(+) from a labeled molecule of octane-2D sub 1 agreed. The first potentials of the C sub n H sub (2n+1)(+) ions corresponded to the process of rupture of a single C-C bond. The energy of rupture of this C-C bond of the octane molecular ion increased with the decreasing number of C atoms in the C sub n H sub (2n+1)(+) ion. Fragment ions of the type C sub n H sub 2n(+) are created by the formation of an ion and 1 new molecule.

AD-257 149 Div. 4
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE RESULTS OF THE EIGHTH MENDELEYEV CONGRESS (K Itogam VIII Mendeleyevskogo S'Yezda),
by S. Ya. Pletkin. Oct 60, 23p. (Trans. no. MCL-588 from Khimicheskaya Nauka I Promyshlennost' 4:145-153, 1959)

Unclassified report

DESCRIPTORS: *Chemistry, *Chemical engineering, *Symposia, *USSR, Synthesis, Fertilizers, Insecticides, Rodenticides, Automation.

Particular attention was given to the problems of organic synthesis based on natural gas, petroleum, coal, wood, and minerals; the production of mineral fertilizers and chemical pesticides; the construction of chemical machinery; the processes and apparatus of chemical technology; and to automation. A number of papers treated the production of new alloys and silicates.

AD-257 303 Div. 4, 25
(9 June 61) OTS price $2.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
SOLID-STATE VIBRATIONAL SPECTRA OF ETHYLENE AND ETHYLENE-d4,
by Marilyn E. Jacox. 10 May 61, 20p. incl. illus. tables.
(Contract AF 49(638)542)
(AFOSR-764)

Unclassified report

DESCRIPTORS: *Ethylenes, Low temperature research, Cryogenics, Crystals, Crystal structure, Lattices, Deuterium, Phase studies, Phase transitions, Infrared spectroscopy, Raman spectroscopy, Molecular spectroscopy, Vibrations, Solid state physics, Solutions, Molecular structure, Deuterated compounds.

High resolution infrared spectra have been obtained for polycrystalline C_2H_4 at 4 K and 53 K and for C_2D_4 at 53 K. The observed multiplet structure of the fundamental vibrations is in good agreement with the group theoretical predictions. In C_2H_4 there is evidence for a gradual phase transition between 4 K and 53 K, involving reorientation of the planes of the H atoms of C_2H_4 molecules in the crystal. The Raman-active fundamentals have been observed, weakly, in thick deposits of C_2H_4 at 4 K. (Author)

5. COMMUNICATIONS

AD-256 920 Div. 5
(5 June 61) OTS price $2.60

Aberdeen Proving Ground, Md.
ROAD SHOCK AND VIBRATION TEST OF THE RADIO SET AN/GRC-106, MODEL SSB, MOUNTED ON TRUCK, UTILITY, 1/4-TON, 4X4, M38A1,
by G. C. Hiob. May 61, 1v. incl. illus. (Rept. no. DPS-239)
Unclassified report

DESCRIPTORS: *Radio equipment, Communication equipment, *Transmitter receivers, Tests, Shock, Vibration, Vibration isolators, Simulation, Installation, Acceleration, Motion, Mounting brackets, Cargo vehicles, Test methods, Measurement.

Results are presented of road-shock and vibration studies on dummy packages simulating the radio set, AN/GRC-106, Model SSB as installed rigidly and with isolators on the left sponson of an M38A1 truck. With the radio set in place, the vehicle was operated over a series of test courses. Accelerations were measured on the vehicle sponson and on the simulated radio sets for both conditions for study. Peak acceleration values measured during operation under conditions of rigid mounting were 2.5g vertically, 3.2g transversely and 3.3g longitudinally. Peak accelerations measured during conditions of isolated mounting were 3.1g vertically, 2.7g transversely, and 3.9g longitudinally. The maximum acceleration of 3.3g measured at the top of the AN/GRC-106 radio (rigidly mounted) was excessive and was generally considered about normal response for gear transported on wheeled vehicles. Installation of isolators between the vehicle sponson and the radio set is not justified on the basis of these tests. (Author)

AD-256 929 Div. 5
(5 June 61) OTS price $2.60

RCA Defense Electronic Products, New York.
RESEARCH ON PARAMETRON STORAGE AND CONTROL UNITS FOR A SWITCHING OFFICE,
by L. Stambler, A. Weiss, and J. Ceonzo. Quarterly progress rept. no. 2, 1 Jan-31 Mar 61, 30 Apr 61, 24p. incl. illus. (Rept. no. CR-61-419-3B)
(Contract DA 36-039-sc-87170)
Unclassified report

DESCRIPTORS: *Telephone communication systems, *Panel boards (Electricity), Automatic, Design, Switching circuits, Transformers, Direct current, Electrical networks, Circuits, Memory devices, Reliability.

Investigations continued in the design of a tactical switchboard for voice switching. Blocking characteristics of the proposed three stage network were studied. Curves of blocking probability vs. the amount of traffic were obtained, demonstrating the efficiency of the network. A novel approach to the placement of registers within the matrix, which will produce further improvement in switchboard efficiency, is described. Areas where time sharing techniques and common control operation are most applicable were defined. Four wire balanced vs. four wire unbalanced switching was studied and it was concluded that 4 wire unbalanced switching would prove more economical. Basic timing cycles for the system were established and a detail block diagram of the system was produced. Detail logic design of the system was initiated. (Author)

AD-257 017 Div. 5, 8
(7 June 61) OTS price $9.10

Research Inst., U. of Michigan, Ann Arbor.
A SURVEY OF SINGLE-SIDEBAND AND ASSOCIATED TECHNIQUES FOR VOICE COMMUNICATION,
by A. L. Rock, R. J. Tromley, and D. R. Rothschild. Jan 61, 103p. incl. illus. tables, 43 refs. (Technical rept. no. 117; 2899-42-T)
(Contract DA 36-039-sc-78283, Projs. 3A99-06-001-01 and 2899)
Unclassified report

DESCRIPTORS: *Voice communication systems, *Sidebands, Countermeasures, *Radio communication systems, *Telephone communication systems, Propagation, Radio interference, Radio waves, *Modulation, Radio transmitters, Radio receivers, Noise (Radio), Effectiveness, Mathematical analysis, Power, Radiotelephones.

A survey of techniques and systems pertinent to the area of single-sideband voice communications is presented. Allied techniques, such as synchronous communication, compatible single-sideband, exalted carrier reception, etc. were included to make the report more comprehensive and to emphasize the importance of these alternative techniques for radio-telephone communications. The basic concepts of single-sideband are given and the advantages of savings in power and spectrum, improved propagation, and other features are weighed against increases in cost and complexity of equipment and, as argued by some opponents of SSB, the questionable merits of some of these advantages. Various methods of signal generation and reception are illustrated; diagrams and analysis are given in many cases. The topic of the power comparison between single-sideband and conventional amplitude and double-sideband modulations is discussed at some length. In addition to a number of example calculations with different types of modulating signals, the effect of speech processing is also considered. Finally, the effects of noise and interference in some of the basic receivers are analyzed. (Author)

AD-257 079 Div. 5, 8
(5 June 61) OTS price $6.60

Stanford Research Inst., Menlo Park, Calif.
A NEW APPROACH TO THE EVALUATION OF HF AIRCRAFT ANTENNAS,
by J. F. Cline. Mar 61, 57p. incl. illus. tables, 13 refs. (Technical rept. no. 72)
(Contract AF 19(604)3458; SRI Proj. no. 2494)
(AFCRL 314) Unclassified report

DESCRIPTORS: High frequency, *Airplane antennas, Antennas, *Radio communication systems, Signal-to-noise ratio, Noise (Radio), Reduction, Propagation, Numerical methods and procedures, *Radio transmitters, Radiofrequency power, *Ionospheric propagation *Voice communication systems, Statistical analysis, Radio interference, Indexes, Radio receivers, Radio ranges, Mathematical prediction.

A method is described for obtaining a factor of merit for an airborne HF transmitting system, taking into account the transmitter power and the variations in antenna gain with respect to azimuth, elevation, and frequency, in cases where the principal mode of propagation is the one involving reflections from the F-layer of the ionosphere. A set of special numerical tables is employed, based on calculations of elevation angle, optimum frequency, propagation loss, and receiver-site noise for more than 50,000 postulated communication events having various path lengths, directions, locations, and times of occurrence. For a given value of transmitter power and a given antenna-gain pattern, the tables indicate the number of successful communication events expected for each of many combinations of azimuth, elevation, and frequency. The factor of merit is defined as the ratio of the total number of successful events to the total number of events postulated. (Author)

AD-257 193 Div. 5
(7 June 61) OTS price $1.10

Army Arctic Test Board, Seattle, Washington.
SERVICE TEST OF AN/URC-10 PERSONAL RESCUE RADIO.
9 May 61, 9p. incl. illus. (Proj. no. ATB 4-141)
Unclassified report

DESCRIPTORS: Radio equipment, Arctic regions, Tests, Reliability, Very high frequency, *Subminiature electronic equipment, *Transmitter receivers, *Voice communication systems, *Radio communication systems, Test methods, Radio ranges, Rescues, *Distress signals, Maintenance, Military personnel, Reliability.

Efforts were made to determine the suitability of the AN/URC-10 Personal Rescue Radio for Army use under arctic winter conditions. The AN/URC-10 personal rescue radio is a subminiaturized, completely transistorized UHF radio set. It consists of a crystal-controlled receiver-transmitter, a 16-v dry battery, and a power cable assembly. The unit operates in the 240-260 mc frequency band. Line of sight tone transmission and voice communication ranges for this equipment are approximately 30 naut mi. After review of test results, it was concluded that the AN/URC-10 is suitable for Army use under arctic winter conditions. (Author)

AD-257 313 Div. 5, 8
(9 June 61) OTS price $4.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
EXPERIMENTAL SIMULATION OF RAYLEIGH FADING,
by Edward E. Cossette and Alfred S. Kobos,
Apr 61, 39p. incl. illus, tables, 28 refs
(Rept. no. RADC TN 61-23)
(Proj. 4519)
Unclassified report

DESCRIPTORS: *Radio communication systems, Atmosphere, Scattering, Radio waves, *Radio signals, *Attenuation, Noise generators, Electronic circuits, *Statistical functions, Functional analysis, Mathematical analysis, Communications theory.

Research was performed to combine two Rayleigh distribution functions to represent signal amplitude in tropospheric scatter communication. Addition of several signals is considered and expressions are given for the calculation of the time statistics of the summed signal. Circuitry by which data were taken is described. Graphs of distributions for combined signals with different median levels are shown. Data are presented for the durations of fades and the general shape for the density function representing the level crossings is discussed. The results of the experimental data are useful in predicting the expected performance of the types of combiners where two input signals are added since the distribution function of the combiner output can be obtained if the distribution of each input is known. (Author)

AD-257 420 Div. 5, 30
(12 June 61) OTS price $11.00

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
CODING AND DECODING OPERATIONS RESEARCH. VOLUME II,
by M. Mitchell, C. Burton and others. Final rept., vol. 2. 14 Jan 61. 1v. incl. illus. tables, 67 refs.
(Contract AF 19(604)6183)
(AFCRL-8, vol. 2) Unclassified report

DESCRIPTORS: *Coding, Operations research, Data processing systems, Matrix algebra, Errors, Data transmission systems, Sequences.

Contents:
Part 3: Cascade Decoding Pulses and Error-Correcting Logic
Part 4: Analog Decoding of Certain Cyclic Error-Connecting Codes
Part 5: Application of Error-Correction Coding for Toleration of Pulse Interference
Part 6: Survey of Decoding Techniques for Error-Correcting Coding

6. DETECTION

AD-256 937 Div. 6, 25
(5 June 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
A METHOD OF DESIGN FOR A PRISM-ERECTING TELE-

SCOPIC SYSTEM,
by W. J. Growney and Wright H. Scidmore. Apr 61, 19p. incl. illus. tables (Memo. rept. no. M61-24-1)
(Proj. 5W13-07-010)

Unclassified report

DESCRIPTORS: *Telescopes, Optical systems, *Telescope lenses, *Prisms (Optics), Light, Design, Lenses.

A method of covering the design of an optical system for a prism-erecting telescopic system of 7X, having a field of view of 8 degrees and an exist pupil diameter of 5mm, is presented. Throughout the design, utilization is made of a Royal McBee, LGP-30 computer suitably programmed for computation of the third order aberrations and the tracing of selected trigonometric rays. The design approach starts with an initial set of data, based on past experience, bends the two air spaces of the Erfle eyepiece to effect a desired correction for astigmatism and, finally, bends and corrects the objective lens in order to compensate for the chromatic, spherical, and coma aberrations of the prism eyepiece combination. (Author)

AD-256 940 Div. 6, 3
(5 June 61) OTS price $2.60

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
PRIVATE EYE. SMALL APERTURE FILTER-WHEEL LOPAIR SYSTEM.
Final rept. 1961, 24p. incl. illus.
(Contract DA 18-108-405-cml-953)

Unclassified report

DESCRIPTORS: *Infrared radiation, *Chemical warfare agents, *Detection, Sensitivity, Infrared filters, Rotating structures, Tests, Atmosphere, *Infrared detectors, Trigger circuits, *Subminiature electronic equipment, Thermistors, Electronic circuits, Design, *Toxic agent alarms.

Research is presented to demonstrate that a passive LOPAIR instrument can be constructed small enough to be easily handled by one man and still provide adequate sensitivity. A 2.5 in. aperture was chosen for the Private Eye system. Adequate sensitivity can be maintained by trading aperture for f number when the optical field of view is filled with the CW agent. Another purpose of the development effort was to evaluate the relative merits of a rotating filter wheel as a means of separating the analytical and reference wavelengths. The IR filters used in the filter wheel consist of common, inexpensive materials (Kel-F and talc-impregnated polyethylene). The rotating filter-wheel technique was proved satisfactory and considerably cheaper and simpler than a dual-channel radiometer or a system using reflecting filters. (Author)

AD-256 959 Div. 6
(5 June 61) OTS price $8.60

Stanford Research Inst., Menlo Park, Calif.
POSITION-LOCATION NETWORK STUDY,
by J. H. Priedigkeit and E. A. Elpel. Quarterly progress rept. no. 2, 1 Oct-31 Dec 60. Jan 61, 1v. incl. illus.
(Contract DA 36-039-sc-84966, Proj. 3E44-02-001-02)

Unclassified report

DESCRIPTORS: *Position finding, *Direction finding, Radio equipment, High frequency, Servo systems, Automatic, Radio receivers, Electrical networks, Crystal oscillators, Teletype equipment, Data transmission systems, Tuned circuits, Design.

Four task areas have been established on a program whose objective is to lay a foundation for the development of an automated tactical radio-direction-finding system. These task areas are: (1) investigation of remote tuning of a network of radio receivers by means of a standard 60-word-per-minute teletype circuit, (2) investigation of semi-automatic bearing read-out, evaluation, and transmission, (3) investigation of field-data evaluation and processing techniques, and (4) over-all systems study and planning. The major effort was devoted to the design and construction of equipments to automatically encode receiver tuning instructions for teletype transmission, and to automatically decode and servo-tune the slave receivers of the direction-finding network. The investigation of semi-automatic bearing read-out, and the evaluation of field data have been started, and a tentative solution to these problems has been formulated. (Author)

AD-257 085 Div. 6
(6 June 61) OTS price $4.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
STUDY OF UNIQUE DETECTION TECHNIQUES,
by James O. Burgess and William S. C. Chang. Final engineering rept., vol. 1, 1 Dec 59-30 Nov 60, 1 Dec 60, 39p. incl. illus. 50 refs.
(Rept. no. 1040-1)
(Contract AF 33(616)6849)

Unclassified report

DESCRIPTORS: Detection, *Detectors, Electromagnetic waves, *Acoustic detectors, Particles, Vapors, Chemical warfare, Optical equipment, Biological warfare, Microwave equipment, *Crystal detectors, Microwaves, Physiology, Superregeneration, Sensitivity, Quantum mechanics, Piezoelectric effect, *Thermal radiation, Microwave spectroscopy, *Infrared detectors, Radar equipment, Aerial reconnaissance, Nuclear explosions.

Research is concerned with new detectors or detection techniques for surveillance applications. Detectors of action at a distance phenomena are considered with special attention given to biologic detectors. Emphasis is on sensitivity and representative detectors are compared in terms of quantum efficiency. Two experimental detectors are described and other detection schemes are suggested. Superregeneration is extended to the D.C. case where it is compared with the behavior of nerve membrane. It is concluded that detectors based on quantum mechanical principles offer the ultimate in sensitivity and frequency range while detectors based on neurophysiological schemes offer the ultimate in small size and high gain. (Author)

AD-257 164 Div. 6, 2
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELEMENTS OF AUTOMATIC TRACKING EQUIPMENT OF THE SOLAR THERMOPOWER STATION (STS) (Elementy Avtoma-

tiki Slezheniya Solnechnoy Teplosilovoy Stantsii (STS),
by Ya. T. Shermazanyan and R. R. Aparisi.
18 Jan 61, 16p. incl. illus. (Trans. no. MCL-780 from Izvestiya Aka emii Nauk Armyanskoy SSR, Seriya Tekhnicheskikh Nauk 13:57-70, 1960)
Unclassified report

DESCRIPTORS: Tracking, Automatic, Design, *Sun, *Optical tracking, Photoelectric cells, *Reflectors, Phototubes, Optical equipment, Solar energy, Mirrors, Resistors, USSR, Focusing, *Astronomy, Cadmium.

The design is presented of an automatic tracking Solar Thermopower Station (STS). The STS consists basically of mirror reflectors mounted on a guide trolley. Three automatically controlled movements are utilized: (1) horizontal-azimuthal travel of the trolley over rails, (2) zenithal rotation of the reflectors about the horizontal axis, and (3) azimuthal rotation of the supporting plate around the verticle axis. Greater accuracy is obtained in the automatic tracking of the sun by the STS equipment because the controllable optical systems of the individual reflectors belong to long-focus systems.

AD-257 170 Div. 6, 12
(5 June 61) OTS price $5.60

ITT Federal Labs., San Fernando, Calif.
RESEARCH ON THE DETECTION OF INFRARED EMISSION FROM SATELLITE VEHICLES,
by F. F. Hall, Jr., C. V. Stanley and T. P. Dixon.
Dec. 1960, 1v. incl. illus. tables, 42 refs.
(Scientific rept. no. 1)
(Contract AF 19(604)-4971)
(AFCRL-215) Unclassified report

DESCRIPTORS: *Satellite vehicles, Thermal radiation, Thermionic emission, *Infrared radiation, Detection, Radiometers, *Infrared detectors, Infrared scanning, Recording devices, Orbital flight paths, *Infrared optical systems, Measurement, Mathematical prediction, Design, Tests, Infrared telescopes, Infrared tracking, Meteorology.

A 20 inch aperture infrared radiometer designed to detect infrared emission from satellite vehicles is described. The radiometer may be equipped with either cooled lead sulfide or cooled indium antimonide detectors. Radiation modulation is accomplished by space filter type chopper discs enabling angular resolution of 1167 waves per radian to aid in background suppression. A nodding Newtonian folding mirror provides for scanning the 1/4 x 1/4 degree instantaneous field over + or - 2.5 degrees in the search-acquisition mode of operation. A memory oscilloscope is used to correlate low level signals by their ordered appearance in repeated line scans. Infrared irradiance measurements from orbiting satellites are presented. It is shown that other satellites must have been significantly cooler than 500 degree Kelvin to escape detection due to their passive radiation only. Techniques are described for predicting satellite orbits and optimizing search scan procedures. Infrared background measurements for daytime, twilight, and night sky conditions are presented. (Author)

AD-257 171 Div. 6, 12
(6 June 61) OTS price $8.10

Philco Corp., Palo Alto, Calif.
POLYSTATION DOPPLER SYSTEM,
by P. L. Besag. 4 May 60. 1v. incl. illus. (Rept. no. WDL-TR1278; BRL DOPLOC Satellite Fence Series rept. no. 11)
(Contract DA 04-200-509-ORD-1002, Proj. TB3-0538)
(ARPA Order no. 8-58) Unclassified report

DESCRIPTORS: *Position finding, Doppler systems, *Doppler tracking, *Satellite vehicles, Mathematical analysis, Errors, *Orbital flight paths, Detection, Data processing systems, *Doppler radar, Velocity, Equations, Design.

The polystation doppler system has the ability to acquire and track a moving vehicle. The system refers to an acquisition and tracking system of more than one station which gathers only information regarding diminution or augmentation of received cycles due to motion of the vehicle relative to the station complex. The region of coverage is 800 miles long and 1000 miles high, and is limited laterally by the sides of a wedge-shaped beam. The error study which was performed for circular orbits, resulted in data which is presented in the form of graphs, some as curves and some as straight-line graphs. To permit selection of optimum beamwidth, errors were studied for values from 8 to 30 degrees. In order to aid in evaluating a system after the beamwidth has been decided upon, graphs of error propagation factors were plotted holding beamwidth constant.

AD-257 178 Div. 6, 2, 20
(6 June 61) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
APPLICATION OF WEATHER RADAR TO FALLOUT PREDICTION,
by Pauline M. Austin. Quarterly technical rept. no. 12, 1 Dec 60-28 Feb 61. 15 Mar 61. 10p. incl. illus.
(Contract DA 36-039-sc-75030, Proj. 3A99-07-001-01-03)
Unclassified report

DESCRIPTORS: *Meteorological radar, *Radioactive fall-out, Atomic bomb explosions, Storms, *Meteorological data, Meteorology, Precipitation.

Investigation concerns the application of radar to the prediction of radioactive rainout resulting from a nuclear detonation. It is recognized that precipitation particles scavenge radioactive dust in the atmosphere so that fallout patterns are altered by the occurrence of rain and snowstorms. Since the precipitation exhibits significant small-scale variability the rainout amounts at any particular points may differ considerably from the average value for the general area. Rainout computations for a 10 KT detonation in a selected wind field are nearly complete. Some of the results are summarized. (Author)

AD-257 491 Div. 6, 26
(12 June 61) OTS price $1.60

Servo Corp. of America, Hicksville, N. Y.
INDUSTRIAL PREPAREDNESS MEASURE FOR THERMISTOR BOLOMETER INFRARED DETECTORS,
by Irving Meltzer. Quarterly progress rept. no. 7, 27 Dec 60-26 Mar 61. 8 May 61, 14p. incl. illus. (Rept. no. SCA 10300-RQ-7)
(Contract DA 36-039-sc-81288)
Unclassified report

DESCRIPTORS: *Infrared detectors, Production, *Bolometers, Thermistors, *Manufacturing methods, Infrared equipment, Quality control, Tests.

Plans were continued on a mass production facility capable of producing a representative variety of qualified thermistor bolometers. The following parts were manufactured: (a) flakes for all eight series, (b) Heat sinks for all eight series, (c) germanium windows and lenses, and (d) housings for the bolometers. The connector pin length was modified. The procedure for assembling the flake and heat sink into the housing was also modified. Resistance and peak voltage data were recorded and are presented in the form of graphs. (Author)

AD-257 522 Div. 6, 12
(12 June 61) OTS price $10.10

Melpar, Inc., Watertown, Mass.
UNCLASSIFIED EXTRACTS FROM ARPA SEMIANNUAL TECHNICAL NOTE APPLICATION OF RECOGNITION THEORY TO DETECTION, DISCRIMINATION, AND DECISION.
Rept. for 1 Oct 59-30 June 60. 30 June 60, 1v. incl. illus. 115 refs.
(Contract AF 30(602)2112, Proj. 4983)
(ARPA order no. 73-59) Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Detection, *Target recognition, Identification, Infrared decoys, Aerial targets, Mathematical analysis, Data processing systems, Matrix algebra, *Antiaircraft defense systems, Learning, Reliability, Theory, Partial differential equations, Data storage systems.

The application of pattern recognition to missile detection and decoy discrimination was investigated. As a result of these investigations, a mathematical theory was developed to achieve the optimum combination of measurable or computable target properties to achieve the separation of target types, based on their observable properties. The input to the theory is the set of discrimination techniques and useful target-signature parameters. The theory operates on these inputs to determine their optimum method of combination and thus determine what the essential properties of targets are that allow their recognition. An important attribute of the theory is that it does not become obsolete as new techniques are developed and break-throughs are achieved in methods of distinguishing one type of target or threat from another. The achievement of the present theory is that it states how techniques developed by others are to be combined. (Author)

AD-257 536 Div. 6, 8
(13 June 61) OTS price $2.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
STUDIES AND INVESTIGATIONS LEADING TO THE DESIGN OF A RADIO DIRECTION FINDER SYSTEM FOR THE MF-HF-VHF RANGE,
by A. D. Bailey, J. D. Dyson and E. C. Hayden.
Quarterly progress rept. no. 7, 1 Jan-31 Mar 61. 30 Apr 61, 22p. incl. illus. table.
(Contract DA 36-039-sc-84525)
Unclassified report

DESCRIPTORS: *Direction finding, *Radio equipment, Medium frequency, High frequency, Very high frequency, Propagation, Bearing finding, Data processing systems, Antennas, Doppler systems, Interferometers, Display systems, Conical antennas, Helical antennas, Analog computers, Calibration, Radio waves, Design, Loop antennas.

Investigations continued on the design of a radio direction finding (RDF) system for the MF-HF-VHF range. The full instrumentation for an experimental MF/HF phase comparison RDF system was decided upon. Study of an antenna for the UHF phase comparison system was continued. The wave-antenna RDF system was moved into the field for evaluation. Experimental investigations of automatic bearing data readout systems using phase-lock and panoramic techniques were continued. (Author).

AD-257 597 Div. 6
(13 June 61) OTS price $5.60

Director of Defense Research and Engineering, Washington, D. C.
STANDARD PROCEDURE FOR TESTING INFRARED DETECTORS AND FOR DESCRIBING THEIR PERFORMANCE,
by R. Clark Jones, Deryck Goodwin, and George Pullan. 12 Sep 60, 45p. incl. illus.
Unclassified report

DESCRIPTORS: *Infrared detectors, Infrared equipment, Infrared radiation, Test methods, Measurement, Test equipment, *Test sets, Standards, Specifications, Effectiveness, Detectors, Reports.

A working panel composed of representatives from the United States, the United Kingdom, and Canada was established to prepare a joint standard on infrared detector measurements. This standard recommends the kind of tests to be made on infrared detectors and the manner of presenting the test results, with the following 2 major aims: (1) the method of presentation shall be such that reports of any testing laboratory will be immediately intelligible to infrared workers in all 3 countries, and (2) the test results shall have maximum utility for the users of detectors. This standard is intended primarily to include all common types of visible and infrared detectors that provide a useful measure of the total radiation incident on the responsive area. The intent of this standard is that enough measurements will be made and sufficient data will be presented to permit a user to estimate the performance of a detector in a particular application. (Author)

7. ELECTRICAL EQUIPMENT

AD-256 916 Div. 7, 12, 20
(6 June 61) OTS price $13.10

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME XI. RADIOISOTOPE SYSTEM DESIGN.
Sep 60, 1v. incl. illus. tables, 147 refs. (EOS rept. no. 390-Final, Vol. 11)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, Vol. 11)
Unclassified report

DESCRIPTORS: *Power supplies, *Nuclear power plants, *Spaceships, *Space probes, Radioactice isotopes, Generators, Heat exchangers, Thermocouples, Thermoelectricity, Sources, Isotope availability, *Satellite vehicles, Auxiliary power plants, Electromechanical converters, *Radiation hazards, Solar energy, Electricity, Solar cells, Reliability, Fuels, Processing, Energy, Heat transfer, Design, Handbooks.

The Martin Company in Baltimore, has been engaged in extensive research and development work on isotopic-powered generators. A description is presented of their work in basic technology, radiation safety, and specific equipment design. Basic work includes methods of preparation and containment of fuels, energy conversion systems, and generator design principles. Prevailing concern over radiological hazard is answered by discussion of each possible hazard situation from ground handling to various vehicle missions, including aborts. Five practical generator designs are presented including SNAP IA, a 125-watt, one-year generator using Cerium-144, and the Polonium-fueled SNAP III, both of which have progressed to the advanced hardware stage. A comparison of nuclear- and solar-powered generators indicates some advantage for the nuclear device for requirements of less than 1 kwe when the mission involves long periods of flight away from the sun. (Author)

AD-256 939 Div. 7, 4
(5 June 61) OTS price $6.60

General Electric Co., West Lynn, Mass.
RESEARCH ON LOW TEMPERATURE FUEL CELL SYSTEMS.
Progress rept. no. 14, 15 Oct–15 Dec 60.
15 Dec 60, 67p. incl. illus. tables, 19 refs.
(Contract DA 44-009-eng-3771)
Unclassified report

DESCRIPTORS: *Fuel cells, Low temperature research, Power supplies, Electrochemistry, *Electrodes, Catalysts, Catalysis, *Oxygen electrodes, Porous materials, Plastics, Polymers, Fluorides, Ethylenes, Design, Ion exchange, Carbon, Platinum, Reaction kinetics, Powder metals, Hydrocarbons, Liquids, Test equipment, Instrumentation, Microanalysis, Gases.

FUEL ELECTRODE STUDIES: The effect of varying the Pt black upon the performance of porous pasted catalyst screen electrodes was evaluated. Polarization curves of cells containing Engelhard Pt black electrodes and operating on H and ethylene indicated that some improvement was achieved with both these fuel gases. Variations in the performance of different Pt blacks were also observed with the conducting porous Teflon electrodes, especially with O, both in acidic and alkaline cells. Metal powders were evaluated in the pasted catalyst screen electrode structure for their ability to promote oxidation. Examination of C-base electrodes continued using the conducting porous Teflon structures. A micro gas system was constructed for the measurement of gas consumption by fuel cells under load. OXYGEN ELECTRODE: Research of the kinetics of the O electrode in acidic and alkaline media continued using porous platinized, semi-hydrophobic carbons and/or Pt as the electrode materials. Open circuit voltages of 1.20 + or – 0.03 v for the O electrode were reproduced in 25% KOH solutions and platinized C or Pt electrodes.

AD-256 961 Div. 7, 20, 25
(6 June 61) OTS price $2.60

Aerospace Corp., Los Angeles, Calif.
HIGH CURRENT STEP GENERATOR,
by Erich S. Weibel. 14 Mar 61. 18p. incl. illus.
(Rept. no. TDR-594-(1208-01)-TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Generators, *Thermonuclear experiments, Thermonuclear reactions, Circuits, Mathematical analysis, Design, Electrical networks, Time switches, *Switching circuits, *Pulse generators.

A new circuit is described for the generation of current step functions of long duration, having a short risetime and yielding a large steady current. A typical set of values is: duration 200 microsecond, risetime .6 microsecond, peak current 20 kiloamps, ripple 10%. The risetime can be decreased at the expense of the current or, to some extent, at the cost of increased ripple. The duration or decay time is independent of the other parameters. (Author)

AD-256 962 Div. 7, 25
(6 June 61) OTS price $1.60

Aerospace Corp., El Segundo, Calif.
A HIGH CURRENT STEP GENERATOR,
by Erich S. Weibel and Ieuan R. Jones. 5 Apr 61.
11p. incl. illus. table. (Rept. no. TDR-594-(1208-01)TR-2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Generators, *Pulse generators, *Switching circuits, Time switches, Circuits, Switches, Design, Mathematical analysis.

A new circuit is described for the generation of current step functions of long duration, having a short rise time and yielding a large steady current. The following set of values has been achieved: rise time, 1 microsecond; duration, 320 microsecond; current, 5 kiloamp. (Author)

AD-256 966 Div. 7
(5 June 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF 30-INCH GENERAL PURPOSE SEARCHLIGHT AND GENERATOR FOR 30-INCH GENERAL PURPOSE SEARCHLIGHT.
7 Apr 61. 8p. illus.
(Proj. NR ATB 1-101)
Unclassified report

DESCRIPTORS: *Searchlights, Artillery, *Searchlight generators, Tests, Arctic regions.

An Arctic service test of 30-inch general purpose searchlight and generator for 30-inch general purpose searchlight was made to determine their suitability for artillery use under arctic winter conditions. It is concluded that: (a) Sufficient testing was not conducted to determine their suitability for artillery use under Arctic winter conditions; and (b) The discrepancies, and as many of the shortcomings as practicable should be corrected. When the discrepancies and shortcomings have been accomplished, a modified 30-inch general purpose searchlight and generator for 30-inch searchlight be provided this Board for test. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-256 973 Div. 7, 4, 25, 26
(6 June 61) OTS price $6.00

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME II, SOLAR-THERMAL ENERGY SOURCES,
by D. H. McClelland and C. W. Stephens. Sep 60, 1v. incl. illus. tables, 32 refs. (EOS rept. no. 390-Final - vol. 2)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 2) Unclassified report

DESCRIPTORS: *Solar energy, *Handbooks, Heat, *Power supplies, Collecting methods, Design, *Mirrors, Reflectors, Curved mirrors, Tests, Materials, Coatings, Space flight, Space environmental conditions, Spaceships, Lenses, Satellite vehicles, Optical equipment, Configuration, Absorption, Thermochemistry, Optical materials, Storage, Processing.

Basic problems in the development of lightweight, high efficiency, solar concentrating mirrors for space power systems are discussed. Various concentrator and absorber configurations are compared both on the basis of idealized performance and in regard to performance degradation due to geometric errors. Concentrator structural design classifications are presented and are related to fabrication techniques, materials, and reflective surfacing methods. Orientation requirements and the effects of the space environment are considered. Tests are presented for determining collector performance and for evaluating mirror surface quality. (Author)

AD-257 067 Div. 7, 1, 8
(7 June 61) OTS price $1.10

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
EVALUATION OF FLAT ELECTRIC CABLE FOR INTERCONNECTING SYSTEM COMPONENTS IN AIRCRAFT.
Progress rept. 22 May 61, 3p. (Rept. no. NADC-EL-L6139)
Unclassified report

DESCRIPTORS: *Electric cables, Aircraft, Coaxial cables, Electric wire, Electronic equipment, Electric connectors, Aircraft equipment, Military requirements, Electronic systems, Standardization.

AD-257 112 Div. 7
(5 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE DEVELOPMENT OF ELECTROSTATIC HIGH-VOLTAGE GENERATORS FOR MEDIUN VOLTAGES (20-100 KV) (Zur Entwicklung Von Elektrostatischen Hochspannung Generatoren Fuer Mittlers Spannungen (20 - 100 kV)),
by F. Eckhart, Jan 61, 15p. incl. illus. (Trans. no. MCL-182 from Experimentelle Technik Der Physik 3:49-57, 1955)
Unclassified report

DESCRIPTORS: Germany, Technological intelligence, Electrostatic generators, *Generators, Direct current, Design, Metal plates, Resistors, Armatures, *Electric power production, Power supplies.

The mode of operation, construction and characteristics of electrostatic high-voltage generators for voltages of from 20 - 50 kv are described. The advantages in comparison to the known machines consist in the fact that they are constructed circuit-symmetrically (rotor with three parts) and that the exciter plates are mounted over high-resistance resistors. The weight of a generator of this type for 25 kv is about 170 g, not including the drive mechanism. The no-load voltage and the performance of the motors are improved considerably by compressed air. By means of suitable stabilization of the voltage this generator could be used where high dc voltages are required at low output. (Author)

AD-257 134 Div. 7, 17, 26
(5 June 61) OTS price $7.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTRICAL CONTACTS (SELECTED ARTICLES).
2 Nov 60, 71p. incl. illus. tables (Trans. no. MCL-480 from Elektricheskiye Kontakty, pp. 79-95; 255-296, 1958)
Unclassified report

DESCRIPTORS: *Sliding contacts, Electric connectors, *Electrical equipment, USSR, Technological intelligence, Welding, Metals, Electric switches, Electric relays, Materials, Alloys, Welded joints.

Contents:
The role of an electrical contact in the process of forming a welded joint
Alloys of noble metals for electrical contacts carrying very low currents and voltages
Alloys for electrical contacts with low contact resistance
The use of new materials for sliding contacts operating in self-synchronizing synchronous transmission systems
Survey of experiments and research on contact materials made of precious metals
The state of production and normalization of contacts and contact materials made of precious metals

AD-257 161 Div. 7
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A NEW DESIGN FOR SMALL ELECTRIC MOTORS (Eine Neue Konstruktion Fur Kleinmotoren)
by H. Juan, Oct 60, 12p. incl. illus. table (Trans. no. MCL-680 from Bulletin des Schweizerischen Elektrotechnischer Verein 48:905-909, Oct 57)
Unclassified report

DESCRIPTORS: *Electric motors, Switzerland, Design, Manufacturing methods, *Induction motors.

A new principle is described for building electric motors, developed in Switzerland. The fabrication methods, made possible by the new principle and the possible uses of the motors are discussed. The characteristics of the new design were investigated and a comparison was made with the usual type of electric motor. (Author)

AD-257 167 Div. 7
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONSTRUCTIONAL AND TECHNOLOGICAL PROBLEMS IN THE MANUFACTURE OF MICRO-TURBO GENERATORS FOR DYNAMIC THREE-PHASE MAINS,
by H. Rachel, 25 Jan 61, 13p. incl. illus. (Trans. no. MCL-791 from Elektrie 13:346-349, 1959)
Unclassified report

DESCRIPTORS: Miniature electrical equipment, *Generators, Design, Electrical equipment, East Germany.

The design problems associated with the development of a small-scale, 5 kw, 3 phase, 231/400-v turbogenerator are discussed. The turbogenerator was estimated to be about 11 times more expensive than a synchronous generator of comparable output. Optimum use of materials could not be effected because of the requirements for the no-load short-circuit ratio, the no-load time constant of the exciter winding and the moment of inertia, as well as the armature resistance. The armature was given a 2-layer complete-gap winding with strong cords and a special material was used for the impedance coils in front of the armature winding to compensate for the stray voltage (11 to 12%) of the machine. The exciter winding was not equally divided in the slots milled in the Armco iron inductor. The large no-load losses of the machine and the difficulties in reproducing the damping circuit prevented achievement of the characteristics specified for the proposed application.

AD-257 183 Div. 7, 30
(5 June 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
CRYOSAR MEMORY DESIGN,
by R. C. Johnston. 19 May 61, 26p. incl. illus. table (Rept. no. 53G-0044)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Computers, *Memory devices, Electric fields, Impurities, Ionization, Germanium, *Electrical equipment, Design.

The compensated cryosar is a negative-resistance two-terminal device utilizing a bulk effect in germanium at liquid helium temperatures. Its use in a computer memory is foreseen because of its bistable nature and its ease of fabrication in large arrays. However, careful consideration of device and circuit parameters is necessary if a successful large memory is to be achieved. (Author)

AD-257 190 Div. 7
(5 June 61) OTS price $3.60

Mallory Battery Co., North Tarrytown, N. Y.
TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES,
by Roger Goodman. Semi-annual rept. no. 1, 15 Jan-1 Sep 60. 1 Sep 60, 35p. incl. illus. tables.
(Contract DA 36-039-sc-78320)
Unclassified report

DESCRIPTORS: *Alkaline cells, *Primary batteries, Zinc, Mercury, Storage, Electric discharges, Temperature, Test facilities, Test methods, Tests, Dry cells, Mercury compounds, Oxides, Voltage.

Establishment of test facilities and procedures: The test facilities were established to provide 5 temperatures for storage and 9 temperatures for discharge. Multi-point chart recorders were installed for load voltage measurement during cell discharge. The test discharges were run using a uniform test panel for the cells and load resistors with voltage cables to the recorders. Test and evaluation of type 12R cell: Preliminary discharge tests were run to establish load values for Initial Discharge, Chart No. 1 of SCL-6274. A start on initial discharge data was made. Test and evaluation of type 42R cell: Preliminary discharge tests were run to establish load values for Initial Discharge, Chart No. 1 of SCL-6274. A start on initial discharge data was made. (Author)

AD-257 191 Div. 7
(5 June 61) OTS price $8.10

Mallory Battery Co., North Tarrytown, N. Y.
TESTING AND EVALUATION OF PRIMARY ALKALINE CELLS AND BATTERIES,
by Roger Goodman. Semi-annual rept. no. 2, 1 Sep 60-1 Mar 61. 1 Mar 61. 82p. incl. illus. tables.
(Contract DA 36-039-sc-78320)
Unclassified report

DESCRIPTORS: *Alkaline cells, *Primary batteries, Zinc, Mercury, Electric discharges, Storage, Temperature, Dry cells, Mercury compounds, Oxides, Tests, Voltage.

Work continued on the program for the initial discharge of 12R cells. Monthly emf readings were taken on 12R cells stored at 70 F. Over 8,000 12R cells were distributed among 5 storage temperatures from -20 to 160 F to provide up to 36 mo of storage. Type 12R cells were placed in cyclic storage of 0 to 130 F for a 12 mo program. Monthly emf readings were taken on 42R cells stored at 70 F. Over 2,000 type 42R cells were placed in storage for the program for 1000-hr discharge rate. These cells for up to 36 mo of storage were placed in temperatures of from -20 to 160 F. (Author)

AD-257 312 Div. 7
(9 June 61) OTS price $1.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
PERFORMANCE OF THE TAP-100 THERMOELECTRIC CONVERTER,
by John E. McCormick. Apr 61, 14p. incl. illus. tables (Rept. no. RADC TN 61-26)
(Proj. 6185)
Unclassified report

DESCRIPTORS: *Thermoelectricity, Reliability, Fuel consumption, Failure (Mechanics), Tests, Insulating materials, *Generators, Design, *Electromechanical converters, Heat exchangers, Thermocouples, Life expectancy, Electricity.

Designed and fabrication data are presented on the TAP-100 thermoelectric converter. Details of performance of the equipment are included. The device was operated to failure with the test program being divided into three parts as follows: (1) a preliminary evaluation during which a number of short runs were conducted so that loading and fuel consumption data could be obtained for various hot junction temperature levels, (2) a life test of the device, and (3) final testing, conducted just prior to disassembly. After testing the device was disassembled and the failure mechanics analyzed. Results indicated failure was caused by a combination of numerous internal shorts and severe junction breakdown. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-257 341 Div. 7
(9 June 61) OTS price $14.00

Radio Corp. of America, Somerville, N. J.
PRIMARY CELLS UTILIZING ORGANIC COMPOUNDS AS THE ACTIVE COMPONENTS,
by E. F. Uhler, R. J. Ryan and others. Quarterly rept. no. 8 (Final) 15 June 58-30 Oct 60. 1 Nov 60, 1v. incl. illus. tables. 43 refs.
(Contract DA 36-039-sc-78048, Proj. 3G18-03-001)
Unclassified report

DESCRIPTORS: *Primary batteries, *Organic compounds, Materials, Nitrobenzenes, Magnesium, Magnesium compounds, Carbon, Water, Cathodes (Electrolytic cell), Hydrazines, Pyridines, Nitro radicals, Furan, Heterocyclic compounds, Dry cells.

Attempts were made to develop the best of the present laboratory-made cells into practical form, suitable for military applications, and to exploit the use of untried organic materials for the purpose of obtaining maximum usefulness from this new class of battery materials. A detailed discussion of the performance of the magnesium-dinitrobenzene cell and a summary of the capacity, shelf-life, delayed action, impedance, and temperature-dependence data is presented. The roles of C and H2O in the m-dinitrobenzene cathode and the effect of Mg efficiency upon cell performance were studied. Various cell configurations (round and flat) were evaluated to provide design criteria for optimum cell structures. A magnesium-m-dinitrobenzene dry cell with a capacity of 90 whr/lb is described. The theory concerning the effect of group type and position in a molecule and its effect on cathode potential is presented for the aromatic nitro and nitroalkane compounds and extended to heterocyclic nitro compounds and organic anode materials. The more important classes of organic anode materials, hydrazine, and organic cathode materials, nitropyridines and nitrofurans are discussed in greater detail. (Author)

AD-257 342 Div. 7, 4
(9 June 61) OTS price $4.60

Radio Corp. of America, Somerville, N. J.
HIGH CAPACITY MAGNESIUM BATTERIES,
by G. S. Lozier and R. J. Ryan. Quarterly progress rept. no. 2, 1 Sep-30 Nov 60. 30 Nov 60, 1v. incl. tables.
(Contract DA 36-039-sc-85340, Proj. 3G-18-03-001)
Unclassified report

DESCRIPTORS: *Primary batteries, *Power supplies, Magnesium electrodes, Magnesium, Magnesium compounds, Perchlorates, Copper compounds, Oxides, Manganese dioxide electrodes, *Dry cells, Design, Electrolytes, Mercury compounds, Anodes (Electrolytic cell), Electrochemistry, Heat production.

The discharge characteristics of the magnesium-cupric oxide reserve cell at high discharge rates were improved by the use of a Hg2CrO4 inhibitor. Various grids were also evaluated for performance and light-weight cell design. Initial characterization of Mg/Mg(ClO4)2/HgO high-rate reserve cells similar in design to the CuO system is summarized. Magnesium anode efficiency data are presented for commercial and AZ-10 alloy over a temperature range of 20 to 70 C. Delayed action and impedance data are given for Mg/Mg(ClO4)2/CuO cells. Delayed action results of Mg/Mg(ClO4)2/MnO2 AA-size cells with AZ-10 and AZ-31 anodes is compared to cells with a MgBr2 electrolyte. Capacity data are presented for magnesium dry cells with a highly reactive synthetic MnO2 (Type L). (Author)

AD-257 357 Div. 7, 4, 12, 25
(12 June 61) OTS price $10.50

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME I - GENERAL SYSTEM CONSIDERATIONS,
by W. R. Menetrey and J. H. Fisher. Final rept., vol. 1 for Sep 59-Aug 60. Sep 60, 1v. incl. illus. tables, 18 refs. (EOS rept. no. 390-Final)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 1) Unclassified report

DESCRIPTORS: *Power supplies, *Handbooks, *Space environmental conditions, Nuclear energy, Solar energy, *Space flight, Guided missiles, Hypervelocity vehicles, Lunar probes, Satellite vehicles, Spaceships, Reliability, Meteorites, Fuel cells, Storage batteries, Thermoelectricity, Van Allen radiation belt, Materials, Analysis, Effectiveness, Design, Costs, Cratering, Electromagnetic waves, Particles.

An introduction is presented to subsequent volumes dealing with specific areas of power system technology. General topics useful in evaluating and rating power systems are discussed including the space environment and its effects; reliability considerations in systems design; figures of merit and their use in system evaluation; power needs of the future and the importance of developing power systems; and an estimate of expected system weights. Environmental effects include meteoroid bombardment, interplanetary and Van Allen corpuscular radiation, electromagnetic solar radiation, and vacuum. It is shown that the effort needed to guarantee high power system reliability may be too costly. The relative position of nuclear, chemical, and solar power systems in a power level-mission duration continuum is presented. (Author)

AD-257 358 Div. 7, 4, 10, 12
(12 June 61) OTS price $13.50

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME VI - CHEMICAL SYSTEMS,
by W. R. Menetrey and J. Chrisney. Sep 60, 1v. incl. illus. tables, 79 refs. (EOS rept no. 390-Final)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 6) Unclassified report

DESCRIPTORS: *Power supplies, *Fuel cells, *Primary batteries, *Storage batteries, Electrochemistry, *Space flight, Theory, *Combustion, Electrodes, Generators, Gas turbines, Storage, Dry cells, Nickel, Cadmium, Silver, Zinc, Mercury, *Heat engines, Liquid rocket propellants, Hydrazines, Liquefied gases, Hydrogen, Oxygen, Thermoelectricity.

Power systems which use chemical fuel as the energy source appear useful in a variety of space applications, and offer weight advantages for durations below about 100 hours. A discussion is presented on primary and secondary batteries, primary and regenerative fuel cells, reciprocating engines using hydrogen and oxygen bipropellant, monopropellant and bipropellant turbines and cryogenic storage of H and O. The theoretical and practical performance of the converters is reviewed, and the weight of various systems is predicted. Other factors besides power system weight may lead to the selection of a chemical system in preference to others. For example, liquid H provides an excellent heat sink for environmental control. While batteries may be approaching the limits of their capability, ma-

jor advances still will be accomplished in the fuel cell and dynamic engine area. For durations of more than several hours primary system weights of 1 to 1.5 lb/hp-hr and secondary specific weights of up to 100 whr/lb appear possible by 1970. (Author)

AD-257 487 Div. 7, 25
(13 June 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
GENERATORS WITH STREAMS OF ELECTRIFIED PARTICLES,
by Marcel Pauthenier. Apr 61, 13p. incl. illus.
(Technical note no. FRL TN 41)
Unclassified report

Translated from the French by U. S. Joint Publication Research Service.

DESCRIPTORS: *Aerosols, Ionic current, Ions, Ionization, *Electrostatic generators, Generators, Gas ionization, Plasma physics, Electrostatics, Particles, Powders, Glass, Design, Electrical properties, Pressure.

If the dusts to be charged in an electric filter are drawn out of the apparatus before undergoing any noticeable precipitation, the stream of gas carries off a substantial current of fixed electricity on the charged particles. The laws of the charging of particles (here insulating) in a mono-ionized field permit the calculation of current carried off. The working stream of gas is carried off by a blower and circulates in a closed circuit. It passes through two insulating columns carrying where the dusts leaving the ionizer are discharged as they leave the rising tube; they return to the blower, completely discharged by the descending tube. The first monopolar apparatuses described function under atmospheric pressure. Their current is limited (for increasing contents of particles) by an inverse discharge at the exit of the ionizer between the ground and the electrified cloud. Thus there is an increase in the internal pressure of the generator; this is the object of the present research. (Author)

AD-257 494 Div. 7, 25
(12 June 61) OTS price $3.60

Transitron Electronic Corp., Wakefield, Mass.
HIGH EFFICIENCY SILICON SOLAR CELLS,
by Pierre Lamond and Paul Berman. Semiannual summary rept. no. 3, 1 July-31 Dec 60. 30 Dec 60, 32p. incl. illus.
(Contract DA 36-039-sc-85250, Proj. 3A99-09-001-03)
(ARPA Order no. 80-59) Unclassified report

DESCRIPTORS: *Solar cells, Design, Semiconductors, Calibration, Tests, Effectiveness, Electron bombardment, Radiation damage, Diffusion, Silicon, Crystals, Coatings, *Power supplies, Materials, Photosensitivity, Reflection.

A summary is presented of the process used at Transitron for the p on n solar cells. These have been superseded by the more radiation resistant n on p type cells. Problems in optimizing the junction depth of solar cells are discussed. The results of diffusion experiments are presented. The calibration of solar cell standards and artificial light systems for the testing of solar cells is discussed. Special attention is given to the problems encountered in using a tungsten artificial light source to determine the efficiency of solar cells. Experimental results are presented which validate the theoretical discussion. Results of electron bombardment experiments on p on n and n on p solar cells are given which show the n on p cell structure to be approximately five times more resistant to damage by 2 Mev and 700 Kev electrons. Electron bombardment experiments on n on p cells fabricated at Transitron are presented which agree with the results obtained with the Signal Corps n on p cells. The fabrication of Transitron radiation resistant n on p solar cells is discussed and the process as developed so far is given. (Author)

AD-257 495 Div. 7
(12 June 61) OTS price $1.60

Technical Operations, Inc., Burlington, Mass.
RESEARCH DIRECTED TOWARD THE IMPROVEMENT OF THE EFFICIENCY OF SILICON BATTERIES BY UTILIZATION OF UNABSORBED PHOTONS.
1 May 61. 15p. incl. illus. (Rept. no. TO-B61-24)
(Contract AF 19(604)7306)
(AFCRL-475) Unclassified report

DESCRIPTORS: *Solar cells, *Power supplies, *Silicon, Solar energy, Phosphors, Adsorption, Dyes, Coatings, Reflection, Photons, Fluorescent dyes, Photographic chemicals, Surfaces, Instrumentation, Test methods, Effectiveness, Infrared radiation, Ultraviolet radiation, Sensitivity.

Attempts were made to increase the power output of Si solar cells by sensitizing the cells to those regions in which they do not respond, (UV and IR) and by increasing the absorption and efficiency of the cells in the spectral regions in which they do respond. Three methods were studied: (1) coating the cell surface with phosphors which absorb in the UV and blue region and fluoresed in the region of response of the solar cell (0.45 to 1.0 microns) and with dye energy-transfer agents; (2) applying antireflection coatings to the cell surface for the region of response; and (3) applying dye sensitizers for the IR region. Adsorption and response of Si solar cells was optimized by industry in the region 0.45 to 1.0 angstroms. Sensitization of the cells by phosphors in the UV region is feasible but the intensity of fluorescence required to drive the cell appears to be greater than that easily achieved by surface coating. Neither sensitization by chemical sensitizers in the UV region nor by dye sensitization in the IR region appears to be possible.

AD-257 509 Div. 7, 14, 26
(12 June 61) OTS price $3.60

Whitney Blake Co., New Haven, Conn.
INDUSTRIAL PREPAREDNESS MEASURE FOR RETRACTILE CORDS,
by R. H. Dudley. Quarterly rept. no. 7 Final, 7 Apr 59-7 Jan 61. 7 Jan 61, 37p. incl. illus.
(Contract DA 36-039-sc-81279)
Unclassified report

DESCRIPTORS: *Cordage, *Electric cables, Rubber, Silicones, Insulating materials, *Electric insulation, Mechanical properties, *Manufacturing methods, Production, Design, Tests, Tensile properties.

Preproduction and pilot runs were made satisfac-

torily on two and seven conductor Buna-S-natural rubber jacketed retractile cords. Tests on these cords comply with requirements of CED TECH REQ. No. 1 and No. 3 respectively with minor exceptions. It appears feasible to produce such cords with these exceptions. Preproduction samples of two and seven conductor silicone rubber insulated and jacketed retractile cords were made and tested. These cords do not meet certain requirements of CED TECH REQ. No. 2 and No. 4 and are not considered suitable for general use. It does not appear feasible to produce satisfactory cords with materials specified. Recommendations are made relative to changes in specification test procedures or requirements in CED TECH REQ. No. 1 and No. 3. (Author)

AD-257 513 Div. 7
(13 June 61) OTS price $10.50

Aerojet-General Corp., Azusa, Calif.
GAS-DRIVEN ELECTRICAL POWER SOURCE.
Final engineering rept. Feb 61, 1v. incl. illus. 11 refs. (Rept. no. 1947)
(Contract AF 30(602)2264)
(RADC TR 61-103) Unclassified report

DESCRIPTORS: *Electric power production, Generators, Power plants, Power supplies, Gas generator engines, *Rocket motors, Design, *Costs, Rocket propellants, Coolants, Turbines, Reliability, Induction generators, Electrostatic generators, Storage tanks, Gas turbines.

A study was performed to determine the economic and technical feasibility of generating 1,000,000 kw of electrical power for 20 hr by using a rocket engine to drive a turbo-electric generator. Equations were derived for the technical characteristics and cost of each major component of the power generation system, including storage tanks, propellants, gas generation system, including storage tanks, propellants, gas generation system, turbine, and electrical generator. The system parameters were optimized on the basis of the lowest cost, practicable system (hardware plus propellant costs) for 20 hr of total operating life. The results show that the system studied is technically feasible and that the first prototype system will cost $25,000,000 after an experimental program costing $400,000 and a system development program, using full-scale components, costing $47,000,000.

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-256 904 Div. 8, 2, 5
(5 June 61) OTS price $1.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
A STUDY OF METEOR RADIANTS AND THE FORWARD SCATTER OF RADIO WAVES BY METEOR TRAILS,
by M. L. Meeks. Final rept. 28 Apr 61, 10p.
(Contract Nonr-99102, Proj. A-241)
Unclassified report

DESCRIPTORS: *Electromagnetic wave reflections, Meteors, Radio waves, Scattering, Antennas, *Radio communication systems, Propagation.

Contents:
On The Relative Contribution of Various Sky Regions to Meteor-Trail Communication, Jesse C. James and M. L. Meeks, 30 June 1956
The Effect of Radiant Distributions on Meteor-Scatter Communication, M. L. Meeks and J. C. James, 1 July 1957
The Influence of Meteor Radiant Distributions on Radio-Echo Rates, Jesse C. James, 20 May 1958
Meteor Shower Studies Using Forward Scatter VHF Radio, J. B. Berry, Jr., November 1960
Effects of Transmission Path Parameters on Meteor-Trail Propagation, T. D. Shockley and W. B. Jones, 15 December 1960

AD-256 924 Div. 8, 18
(5 June 61) OTS price $1.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
RESEARCH ON ELECTRONIC RECONNAISSANCE ANTENNAS.
Interim engineering rept. 1 Dec 60-28 Feb 61, 1 Mar 61, 8p. incl. illus. (Rept. no. 903-20)
(Contract AF 33(616)6211)
Unclassified report

DESCRIPTORS: *Antennas, *Antenna amplifiers, *Microwave amplifiers, Broadband, Diodes, Microwave oscillators, Coupling circuits, X band, Radiofrequency filters, *Dipole antennas, Electronic circuits, *Mixer tubes, Electron tubes, Design, Negative resistance circui Transmission lines, Military intelligence.

Research continued on broadband, low-noise amplifier and mixer circuits suitable for integration into an antenna to form a unified system. A broadband, low-noise, hybrid-coupled parametric amplifier is described. Research was also continued on the use of RF circuitry and nonlinear elements as integral parts of an antenna configuration to perform functions such as mixing, phase-shifting, amplifying, and tuning. The problem of matching a negative resistance element to a transmission line is discussed. Matching of a tunnel diode directly to a dipole by means of a gamma-match is considered. (Author)

AD-256 928 Div. 8
(5 June 61) OTS price $4.60

Diamond Ordnance Fuze Labs., Washington, D. C.
THE 2D-BINARY DIVIDER -- ITS HISTORY, PERFORMANCE, AND INTERCONNECTION,
by Norman J. Doctor. 10 Apr 61, 49p. incl. illus. tables (DOFL rept. no. TR-924)
Unclassified report

DESCRIPTORS: *Frequency dividers, Welding, *Electronic circuits, *Miniature electronic equipment, *Printed circuits, Capacitors, Resistors, Transistors, Design, Diodes, Tests.

Two hundred 2D-binary dividers were evaluated and interconnected. Limited success was experienced with deposited metal and welded interconnection techniques. Jigs, fixtures and techniques employed are detailed. (Author)

AD-256 955 Div. 8, 2, 25
(5 June 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
EXTENSION OF NOSE WHISTLER ANALYSIS,
by R. L. Smith and D. L. Carpenter. 26 Apr 61, 11p. incl. illus. table (Technical rept. no. 8)
(Contract AF 18(603)126)
(AFOSR-615)
Unclassified report

DESCRIPTORS: *Radio interference, Analysis, Propagation, Frequency, Spectrographic analysis, Mathematical analysis, Measurement, Ionization, Sources, Identification, Ionosphere, Ionospheric disturbances.

A method is outlined for obtaining F sub N and T sub N, the nose frequency and the time delay to the nose, for whistlers that do not exhibit a nose on the spectrographic records. The method is based upon a universal whistler dispersion function which is a function of f/F sub N only. Two time-delay measurements, at widely separated frequencies, are made on a whistler trace, and from this information and the universal dispersion function, F sub N and T sub N are obtained. Results of applying the method to actual nose whistlers are tabulated and show good agreement between calculated and measured values of F sub N and T sub N. A method of whistler-source identification is outlined which utilizes approximate information on nose frequency and is particularly useful for middle-latitude whistlers. (Author)

AD-256 970 Div. 8, 25
(5 June 61) OTS price $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
CIRCULARLY POLARIZED RADIO WAVES,
by Leonard Hatkin. Jan 61, 32p. incl. illus.
(ASRDL Technical rept. no. 2167)
Unclassified report

DESCRIPTORS: *Radio waves, *Polarization, Ultra high frequency, *Propagation, Dipole antennas, Antenna radiation patterns, Microwaves, Antennas, Electromagnetic waves, Helical antennas.

A circularly polarized wave is the resultant of two plane polarized waves of the same frequency and magnitude traveling along a common axis of propagation, polarized at right angles to one another and differing in time phase by 90 degrees. UHF techniques producing circular polarization can employ turnstile, dipole-loop, or helix antennas. At microwave frequencies, optical techniques can be used to transform in wave-

guide or free space an already launched linearly polarized wave into a circularly polarized wave. A circularly polarized antenna will not receive its own echo unless the transmitted wave undergoes two reflections. (Author)

AD-256 978 Div. 8, 6
(7 June 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
NOTES ON MTI SIMULATION TECHNIQUES,
by J. W. McGinn, Jr. 7 Oct 58, 14p. (Group rept. no. 45-34)
(Contract AF 19(122)458)
Unclassified report

DESCRIPTORS: *Moving target indicators, Microwaves, Waveform generators, *Radar pulses, Simulation, Range finding, *Radar equipment, *Numerical methods and procedures, Range gating, Mathematics.

The construction is detailed of numbers that are adequate simulations of the voltage waveforms that occur in the range gate of a pulse-type MTI radar system. The radar is assumed to be a coherent, single-delay line, phase only system and the voltage waveforms in question are suitable functions of the phase difference between two successive resultant vectors observed at times t, t + tau, respectively.

AD-256 979 Div. 8, 6
(7 June 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
NOTES ON MTI SIMULATION TECHNIQUES. PART II,
by J. W. McGinn, Jr. 27 Mar 59, 5p. illus. tables.
(Group rept. no. 45-34-1)
(Contract AF 19(604)5200)
Unclassified report

DESCRIPTORS: *Moving target indicators, Waveform generators, Simulation, Microwaves, Range finding, *Radar equipment, *Radar pulses, Mathematics, *Numerical methods and procedures, Range gating.

Notes on MTI simulation techniques (AD-256 978) are continued. Interest is primarily centered on establishing controls on the method of production of a sequence $\{X_n\}$ of numbers with a given power spectrum. Controls are obtained based on a crude error analysis of the difference between the given power spectrum F(g) and the power spectrum $\bar{F}(g)$ derived from the sequence $\{\bar{X}_n\}$, where $\bar{X}_n$ is a truncated or rounded approximation to X_n. A check on controls is presented with some results on the computation of a trial sequence $\{X_n\}$

AD-256 980 Div. 8, 25
(5 June 61) OTS price $1.60

Cruft Lab., Harvard U., Cambridge, Mass.
(No title)
Quarterly status rept. no. 59, 1 Jan-1 Apr 61, 1 Apr 61, 12p.
(Contracts Nonr-186607, Nonr-186616, Nonr-186626, Nonr-186628 and Nonr-186632)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, *Solid state physics, *Electronics, *Nuclear magnetic resonance, Propagation, Very low frequency, Electrons, Ruby, Electrical networks, Ferromagnetic materials, Noise (Radio), Radio communication systems, Paramagnetic resonance, Detectors, Cavity resonators, Communications theory, Control systems, Paramagnetic crystals, Photoelectric cells.

Contents:
Very low frequency propagation
Electron and solid state physics
Electromagnetic radiation
Electronic communications and control systems

AD-257 015 Div. 8, 30
(6 June 61) OTS price $8.10

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
TUNNEL DIODE CIRCUITS FOR SWITCHING THIN FILM MEMORIES,
by Paul C. Davis. Jan 61, 81p. incl. illus. tables, (Technical memo. no. TM-100)
(Contracts AF 33(616)5489 and AF 33(616)7700)
Unclassified report

DESCRIPTORS: *Switching circuits, Electronic circuits, *Diodes, Germanium, Gallium compounds, Arsenides, Thin films, Magnetic materials, Memory devices, *Pulse generators, Design, Transmission lines, Computers, *Trigger circuits, Mathematical analysis.

Tunnel-diode circuits are investigated theoretically as a source of high-speed current pulses capable of switching thin film memories in the order of tens of millimicroseconds. Break-point models of the characteristic curve are constructed and piecewise linear analysis is used to predict and extrapolate experimental results. Three basic circuits were chosen as drivers for various load forms and levels. These were tried in the laboratory and results are given. Each of these circuits utilized a novel quick-recovery feature which was responsible for about one-half to two-thirds of the sum of the diode peak currents necessary for a given load current. The recovery time was made equal to the pulse width, which was 20 millimicroseconds. The triggering delay time was approximately one-half the pulse width for all three circuits. It was concluded that tunnel diodes can be used to drive thin magnetic films in strip lines at the speed desired. (Author)

AD-257 024 Div. 8, 15
(7 June 61) OTS price $2.60

Electronics Research Lab., U. of Calif., Berkeley.
A NEW WAY OF SOLVING MAXWELL'S EQUATIONS,
by V. H. Rumsey. 19 Dec 60. 18p. incl. illus.
(Series no. 60, Issue no. 335)
(Contract DA 36-039-sc-84923)
Unclassified report

DESCRIPTORS: *Microwaves, Electromagnetic waves, Radio waves, Radiofrequency, *Propagation, Mathematics, *Vector analysis, Magnetic fields, Electric fields, Wave transmission, Polarization.

A general solution of Maxwell's equations for a single frequency can be expressed as the combination of two types of solution each of which is characterized by an electric vector which is equal to the magnetic vector times the intrinsic impedance of free space but a quarter cycle out of phase. These two types are mathematically

orthogonal, and each can be conveniently expressed by means of a single scalar. The method leads to circularly polarized surface waves propagating along anisotropic sheets which are perfectly conducting in one tangential direction and perfectly transparent in the orthogonal tangential direction. (Author)

AD-257 035 Div. 8, 4, 25
(8 June 61) OTS price $1.10

Ohio State U. Research Foundation, Columbus.
THE MECHANISM OF OXIDE FORMATION IN THE INITIAL STAGES OF OXIDATION,
by D. W. Rausch, K. L. Moazed, and M. G. Fontana.
Quarterly rept. no. 3, 1 Jan-31 Mar 61.
14 Apr 61, 3p.
(Contract DA 33-019-ORD-3387)
Unclassified report

DESCRIPTORS: *Oxides, *Oxidation, Chemical reactions, *Field emission, Adsorption, Gas diffusion, Crystal structure, Tungsten, *Electron tubes, Surface properties.

Research was conducted on the mechanism of oxide formation by means of a field emission microscope with a tungsten emission tip. Changes in the emission were observed as a result of adsorption of residual gases on the emission tip at room temperature. An improvement was made in the technique for producing field emission tubes by the development of a refractory masking material for pyrex. The high-vacuum technique was refined by the addition of a second getter to the system and the use of a H-purge at elevated temperatures to decontaminate the isolation trap. As adsorption increased the following changes were observed in emission pattern: (1) a gradual decrease followed by an increase in total integrated emission intensity; (2) a gradual decrease followed by an increase in local emission intensity of the area around (111) regions bounded by (211) regions; (3) an initial increase followed by a decrease in the size of the low-intensity regions around (110) and (211); and (4) an initial decrease followed by an increase in the size of the low intensity regions around (100).

AD-257 077 Div. 8
(5 June 61) OTS price $9.60

Stanford Research Inst., Menlo Park, Calif.
APPLICATION OF NEW TECHNIQUES TO LOW-NOISE RECEPTION,
by C. W. Barnes, G. L. Matthaei and others. Final rept. Feb 61. 108p. incl. illus. tables, 19 refs.
(Contract AF33(616)5803)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, *Diodes, *Electron tubes, Electron beams, Space charges, Broadband, *Traveling wave tubes, Amplifiers, Cyclotrons, Noise (radio), Reduction, Design, Tests, Mathematical analysis, Coupling circuits, Theory, *Backward wave amplifiers, *Backward wave oscillators.

Research was concerned with the study of low-noise parametric amplifiers. Study was divided into 2 concurrent tasks: (1) an investigation of electron beam parametric amplifiers, and (2) an investigation of solid-state parametric amplifiers. Summaries are presented of studies on both space-charge-wave and cyclotron-wave devices. Some new and powerful analytical techniques were developed for the study of the noise behavior of complex systems with degenerate electron-beam modes. Research is reported on a circuit-wave amplifier, a generalized coupled mode theory, and an experimental program on a symmetric contra-flow coupler. Results of work on a single-diode, solid-state parametric amplifiers are described. The measured response of two degenerate, parametric amplifiers operated in a balanced configuration with a 3-db coupler is shown. Two balanced amplifiers of this type were operated in cascade with contiguous operating bands in order to achieve extremely wide bandwidth. The analysis and design of traveling-wave parametric amplifiers utilizing both forward- and backward-wave interactions is also described. An experimental amplifier using eight varactors was built and tested. (Author)

AD-257 084 Div. 8
(5 June 61) OTS price $1.10

Airborne Instruments Lab., Inc., Mineola, N. Y.
APPLICATION OF SEMICONDUCTOR DIODES TO LOW-NOISE AMPLIFIERS, HARMONIC GENERATORS, AND FAST-ACTING TR SWITCHES,
by J. C. Greene, J. Kliphuis, and L. Susman.
Quarterly progress rept. no. 11, Mar 61, 5p. incl. table (Rept. no. 4589-I-11)
(Contract AF 30(602)1854)
(RADC TN 61-95) Unclassified report

DESCRIPTORS: *Semiconductors, *Diodes, Amplifiers, *Microwave amplifiers, *Frequency multipliers, Switching circuits, *Transmit-receive tubes, Electron tubes, L band, Tests, Broadband, Design.

Detailed information on the work performed on an L-band voltage-tunable amplifier is presented. The primary design goals for this amplifier were: (1) voltage tunability over a frequency range in excess of 10 percent, and (2) a noise figure of less than 2 db. An experimental model was designed and evaluated. This model had a gain of 15 db and an average amplification bandwidth of about 25 mc that could be tuned from 1150 to 1350 mc by varying only the pump frequency. By varying both the pump frequency and the DC bias applied to the varactor diode, the amplifier pass band could be tuned from 1100 to 1500 mc with a constant gain of 14 db. (Author)

AD-257 129 Div. 8, 7, 25
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SEMICONDUCTORS IN TECHNOLOGY AND LIFE (SELECTED ARTICLES),
by V. Gurov. 26 Oct 60, 23p. (Trans. no. MCL-446 from Poluprovodniki V Tekhnike I V Bytu: pp. 82-105, 1958)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Semiconductors, Thermoelectricity, Generators, Electric power production, *Photoelectric cells, Photoconductivity.

Research conducted in the Soviet Union on semiconductors is presented. The employment of thermoelectric generators for the production of electric power is noted. Various heating methods employing thermal batteries are discussed, as well as the use of these batteries in medical research. Research is reported on the design and manufacture of photocells.

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-257 184 Div. 8, 25
(5 June 61) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SIMPLE THEORY OF TUNNELING AND ITS DEPENDENCE ON A MAGNETIC FIELD,
by P. N. Argyres and B. Lax. 24 May 61, 32p. incl. illus. tables (Rept. no. 81G-0031)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Solids, *Solid state physics, *Diodes, *Magnetic fields, Electrical properties, Electric currents, Mathematical analysis, Semiconductors.

The problem of tunneling in solids is formulated as a time-independent collision problem. The tunneling probability is found in the effective particle and WKB approximations by elementary calculations. The rate of Zener tunneling in an insulator is calculated on the basis of this simple theory and found to be in essential agreement with more rigorous calculations. A detailed expression for the tunnel current in an Esaki diode is derived and discussed. The effect of a longitudinal magnetic field is considered in detail. The case of a transverse magnetic field is briefly discussed. (Author)

AD-257 187 Div. 8
(5 June 61) OTS price $11.00

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
GUIDING AND SCATTERING BY SINUSOIDALLY-MODULATED REACTANCE SURFACES,
by Alexander Hessel. June 60, 123p. incl. illus. table, 19 refs. (Research rept. no. PIBMRI-825-60)
(Contract AF 19(604)2031)
(AFCRL- 130) Unclassified report

DESCRIPTORS: *Electromagnetic properties, Electromagnetic waves, *Waveguides, Wave transmission, Antennas, *Modulation, Surface properties, Resonance absorption, Scattering, Guidance.

The study is divided into 4 main parts: (a) Plane Wave Scattering, (b) Guided Waves (Resonances), (c) The Field of a Line Source Above the Boundary Plane, and (d) Experimental Realization of a Constant Reactance Plane. A rigorous formal solution of the two-dimensional problem, valid for all values of ka, is derived for the scattered field due to an incident plane wave on the sinusoidally-varying surface impedance plane. The explicit expressions for the field amplitudes involve rapidly convergent continuous fractions. Only the E-mode solution, valid for all values of modulation and relative periodicity ka, is evaluated in detail. Rigorous solutions are derived for the propagation characteristics and field distributions of waves guided by the sinusoidally-modulated surface reactance plane. The explicit field amplitudes and the determinantal equation for the propagation wavenumber are expressed again in terms of continued fractions, which are rapidly convergent for all values of modulation M in the case of E-modes, but are more slowly convergent and are valid only for M less than 1 in the case of H-modes. A rigorous formal expression for the field of magnetic line source above the investigated boundary plane is obtained. A physical realization of the constant surface reactance plane is discussed. (Author)

AD-257 197 Div. 8
(6 June 61) OTS price $2.60

Tung-Sol Electric, Inc., Bloomfield, N. J.
RESEARCH AND DEVELOPMENT IN UTILIZATION OF SELF-SUSTAINED ELECTRON EMISSION INVESTIGATION,
by B. G. Firth, Warren C. Johnson, and Donald W. Mayer. Quarterly rept. no. 5, 4 Jan-3 Apr 61. 3 Apr 61, 22p. incl. illus. tables.
(Contract DA 36-039-sc-85120)
Unclassified report

DESCRIPTORS: *Cathodes (Electron tubes), *Cold cathode tubes, Electron tubes, *Oxide cathodes, Coatings, Magnesium compounds, Oxides, Secondary emission, Thin films, Field emission, Thermionic emission, Sprays, Electrostatics, Test equipment, Tests, Single crystals.

Secondary emission properties of MgO cold cathodes were found to be useful indicators in the development of thin film coatings to sustain electron emission. Secondary emission analyzer tubes were developed for this purpose. The secondary to primary emission ratio (delta) must be sufficiently high to sustain electron emission. Optimum coating thickness for a given porosity and/or density is another factor. A one micron thick coating was made to sustain 5.2 ma/sq cm emission. Development of spray coatig formulas is described. Gas sorption experiments prove that measurable amounts of oxygen are adsorbed by the MgO during heating in air at reduced pressure on regular processing. Variations in the amounts of oxygen adsorbed by different coatings of the same weight indicate differences in the surface area of the MgO. This is changed quite considerably by the method of coating material preparation and cathode processing. Sorption of gas is necessary to obtain self-sustained emission. (Author)

AD-257 285 Div. 8
(9 June 61) OTS price $4.60

RCA Defense Electronic Products, New York.
FEASIBILITY OF NON-DEGENERATE TRAVELING WAVE PARAMETRIC UP-CONVERTER,
by H. Boyet and D. Fleri. Feb 61, 39p. incl. illus. tables (Rept. no. CR-61-419-6)
(Contract AF 30(602)2184)
(RADC TN 61-86) Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, Broadband, *Microwave amplifiers, *Diodes, Amplifiers, Design, Measurement, Mathematical analysis.

A theoretical scheme is presented for achieving broadband, nondegenerate traveling wave parametric amplification. In this scheme the parasitic elements of the parametric diode (lead inductance and case capacitance) are utilized in conjunction with the static junction capacitance to achieve broadband synchronism (and gain) among the signal, idle, and pump waves. The application of this theoretical design technique to the program frequencies (50-500 mcs) is analyzed. Operation at various other frequency bands (400-1600 mcs, 2300-3500 mcs) is also discussed. In each case, calculations predict high over-all gain over the given signal band. At the program frequencies the required diode characteristics are beyond the present limits of the diode fabrication art. As a result of these investigations it was concluded that an experimental program to construct a non-degenerate traveling wave diode parametric up-converter was not advisable. (Author)

AD-257 297 Div. 8
(9 June 61) OTS price $3.60

RCA Defense Electronic Products, New York.
BROADBAND S-BAND REACTANCE AMPLIFIER,
by R. Pettai and B. Bossard. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 1 May 61, 27p. incl. illus. (Rept. no. CR-61-419-1B)
(Contract DA 36-039-sc-85058, Proj. 3A99-21-001-01)

Unclassified report

DESCRIPTORS: S-band, *Microwave amplifiers, Amplifiers, Broadband, *Diodes, *Semiconductors, Electronic circuits, Microwave networks, Waveguides, Radiofrequency filters, Low pass filters, Coupling circuits, Design, Theory, Mathematical analysis, Tests.

The first experimental diode mount and the associated circuit elements of the parametric upconverter were designed and fabricated. A detailed description and engineering sketches of the structure are presented. Preliminary tests of the individual components were begun. The circulator coupled parametric amplifier was analyzed in greater detail. The use of appropriate networks in the input and in the idler circuits enabled a bandwidth of 495 mc at a peak gain of 11.2 db to be achieved. This result is theoretical and it is not considered the optimum. Several experimental diode mounts in microstrip line were constructed, but their VSWR was found excessive. (Author)

AD-257 311 Div. 8
(9 June 61) OTS price $2.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
A HALL EFFECT MICROWAVE POWER METER,
by Anthony D. Rugari. Apr 61, 21p. incl. illus. tables, (Rept. no. RADC TN 61-44)
(Proj. 5519)

Unclassified report

DESCRIPTORS: Meters, *Radiofrequency power, *Power meters, Microwave frequency, Measurement, Semiconductors, Materials, *Voltmeters, Intermetallic compounds, S-band, Magnetic fields, Waveguides, Transmission lines, *Crystals, X-band.

The measurement of Hall voltages at frequencies of 3500 and 9050 mc and its application to the measurement of microwave power is described. The Hall crystals used were fabricated from indium arsenide and indium arsenide phosphide, both members of the semiconductor class known as the intermetallic compounds. These materials were chosen because they possess a large electron mobility at room temperature, and thus exhibit a pronounced Hall effect capability. The results obtained show approximately two orders of magnitude of improvement over other reported work in this area and are believed to be the first reported measurement of a Hall voltage at microwave frequencies using the intermetallic compounds. The design of a Hall effect microwave power meter capable of accurately measuring from 1 to 250 watts of CW power at S-band frequencies is described. (Author)

AD-257 314 Div. 8
(9 June 61) OTS price $2.60

Westinghouse Electric Corp., Elmira, N. Y.
SCAN-CONVERSION STORAGE TUBE BASED UPON PERMACHON,
by W. S. Rial. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 22p. incl. illus.
(Contract DA 36-039-sc-85051)

Unclassified report

DESCRIPTORS: *Storage tubes, Electron tubes, Photoconductivity, Electron bombardment, Thin films, Electron guns, Manufacturing methods, *Image tubes, *Image converter tubes, Design, Tests, Metal films, Targets.

Research continued on an electrical-input electrical-output scan-conversion storage tube. Sixteen experimental tubes were started. Nine of these tubes were version-number-two tubes, containing fiber-optic targets, and seven of these tubes were version-number-three tubes, containing EBIC (Electron-Bombardment-Induced-Conductivity) films. Twelve tube starts were completed through tip-off, nine of which were models usable for evaluation. Five of the usable models contained slow-scan vidicon photoconductive targets, which were used for tube processing studies. The four remaining tubes utilized three different permachon-type photoconductive targets, which were used for storage-photoconductor characteristic evaluations. Scan-converter processing techniques were fairly well established for both version-number-two and number-three tubes. EBIC-target fabrication techniques are described. EBIC targets appear superior to fiber-optic targets. (Author)

AD-257 320 Div. 8, 25, 30
(9 June 61) OTS price $8.10

Electro-Mechanics Co., Austin, Tex.
AN EXTENSION OF THE SPHERE TECHNIQUE FOR THE MEASUREMENT OF THREE-DIMENSIONAL RADIATION PATTERNS.
by Fred J. Morris, Francis C. Tormollan, and others. Final rept. 10 Dec 60, 80p. incl. illus. tables.
(Contract AF 30(602)2360, Proj. 4540)

Unclassified report

DESCRIPTORS: *Antenna radiation patterns, Measurement, Electromagnetic waves, Spheres, Radiofrequency, *Radar antennas, Search radar, Angle of arrival.

The results of work performed to extend the capability of the Three-Dimensional Radiation Pattern Measurement Techniques are summarized. The three-dimensional radiation pattern for an AN/TPS-1D radar is presented and time variations of received signal intensity is measured. Studies were made to show the effect of receiving antenna movement and a new concept of a solid pattern evolved. The effects of siting are stressed with respect to the interpretation of radiation measurements. Advances in the control of leakage signals are described and recommendations are given for further improvements. The frequency limitations are given only for the low end of the rf spectrum. The reasons for these limits are related to the size of the components for use below 1Kmc. An alternative method is described which has no low frequency limit but does have an upper frequency limit. Description of improved sphere construction materials and sphere suspension methods are given in the appendices. (Author)

AD-257 321 Div. 8
(9 June 61) OTS price $5.60

Edgerton, Germeshausen and Grier, Inc., Boston, Mass.
RESEARCH STUDIES FOR CATHODE AND GRID ELEMENTS

FOR SUPERPOWER SWITCHES,
by Alfred D. Sheath and David V. Turnquist.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 28 Apr 61, 54p. incl. illus. tables (Rept. no. B-2230)
(Contract DA 36-039-sc-85338)
Unclassified report

DESCRIPTORS: *Thyratrons, *Cathodes (Electron tubes), Electron tubes, Hydrogen, *Switching circuits, *Electronic switches, Diodes, Life expectancy, Electrodes, Plasma physics, Tests, Coatings, Electronic circuits, Evaporation, Measurement.

Research was continued on the study of cathode and grid structures in hydrogen thyratrons. The predominant mechanism causing cathode-coating depletion was determined to be thermal evaporation, and a reasonably accurate curve of the rate of coating evaporation as a function of temperature is presented. Life tests at reduced cathode temperature indicated that a substantial increase in life is possible with a decrease in cathode temperature. Measurements of grid utilization using a special-study tube were made. Under certain conditions, results revealed a current transfer effect (closely related to grid quenching) from one, or several, grid apertures to another aperture. An equivalent circuit for the grid was postulated, based on observation of grid phenomena. Plasma probe measurements made with a special tube, incorporating a hydrogen thyratron type structure, showed that under dc conditions a single double-sheath exists in the grid-cathode region near the grid baffle opening. Static-breakdown voltage measurements were made for various grid-anode geometries and materials. (Author)

AD-257 330 Div. 8
(9 June 61) OTS price $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
RESEARCH STUDIES ON PROBLEMS RELATED TO ECM ANTENNAS.
Quarterly engineering rept. no. 10, 1 Dec 60-1 Mar 61. 31 Mar 61, 13p. incl. illus.
(Contract AF 33(616)6079, Proj. 9-(13-6278))
Unclassified report

DESCRIPTORS: *Antennas, *Dipole antennas, Antenna radiation patterns, *Helical antennas, Electromagnetic properties, *Conical antennas, *Coupled antennas, Impedance, Design, Countermeasures, Integral equations, Numerical methods and procedures, Differential equations, Mathematical analysis.

Contents:
Analysis of log-periodic antennas
Radiation from periodic structures
Log-periodic magnetic current antenna
Log-periodic antennas over ground
Log-spiral antennas
Simple arrays of conical log-spiral antennas
Radiation and impedance properties of curved wires
Antenna impedance transforming network
Collecting systems containing non-linear or active elements
An investigation of the near fields on the conical log-spiral antenna

AD-257 332 Div. 8, 15
(9 June 61) OTS price $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE THEORY OF THE RADIOMETER,
by E. J. Kelly, D. H. Lyons, and W. L. Root.
2 May 58, reissued 19 Sep 60, 29p. (Group rept. no. 47.16)
(Contract AF 19(122)458)
Unclassified report

DESCRIPTORS: *Radiometers, Sensitivity, Measurement, Thermal radiation, Theory, Numerical analysis, Statistical processes, Temperature, Mathematical analysis, Design, Statistical analysis.

The sensitivities of various types of radiometers in current use are computed. The formulation of the problem is kept flexible enough to permit finding the optimum radiometer design. This optimum depends on the definition of sensitivity, and this definition is one of the details in which the procedures used differ from most of the previous English literature on the subject. Another such detail is the model used for the gain fluctuations as a random process. The problem of radiometer analysis is related to the general statistical problem of the estimation of the variance of a stationary random process. The definition of sensitivity and the model for the gain fluctuations permit the evaluation of the sensitivity of a conventional d-c radiometer. The sensitivity is evaluated of a general type radiometer (which includes dc radiometers and conventional modulated radiometers as special cases), and the performance is optimized over the design parameters which are available. The question of optimum detector law is appended. (Author)

AD-257 333 Div. 8, 7, 22
(9 June 61) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
DESIGN AND CONSTRUCTION OF A PELTIER TEMPERATURE-CONTROL DEVICE,
by I. I. Sochard. 24 Apr 61, 39p. incl. illus.
(DOFL rept. no. TR-896)
Unclassified report

DESCRIPTORS: *Temperature control, *Thermoelectricity, Design, *Materials, Tests, Manufacturing methods.

A study was made of the problems of design and construction of Peltier temperature-control devices for use with Ordnance electronics. The principal features sought were (1) compatibility with conventional power supplies, particularly single-cell electrochemical systems, (2) techniques of assembly that are versatile with respect to physical configurations, and (3) techniques of assembly that are readily adaptable to production. A device for cooling was designed, built, and tested that operates from a supply voltage of 1.5 to 2.0 v at input powers up to about 6 w. Eighteen thermoelectric couples were connected in series electrically and in parallel thermally. Aluminum was used as the structural material, serving as both the base and the temperature-controlled chamber. An anodized layer on the aluminum provided good electrical insulation and thermal contact between the structural materials and thermoelectric elements. The circuit patterns were placed on the anodized layer by printed-circuitry techniques. By using jigs that are adaptable to quantity production, all 72 solder joints connecting the elements in series and to the structural materials were made in two operations. (Author)

AD-257 334 Div. 8
(12 June 61) OTS price $4.60

General Electric Co., Syracuse, N. Y.
TUNNEL DIODE CHARACTERISTICS AND CIRCUIT CONSIDERATIONS,
by E. A. Fisch. 8 Mar 61, 47p. incl. illus. table (Scientific rept. no. 4c)
(Contract AF 19(604)6623)
(AFCRL-347(c)) Unclassified report

DESCRIPTORS: *Diodes, *Switching circuits, Electronic circuits, Test equipment, Measurement, Germanium, Theory, Trigger circuits, Circuits.

It has been observed that when low capacitance tunnel diodes are switched very rapidly from the low voltage to the high voltage state, a higher output voltage is obtained than would be predicted from the static V-I characteristic of the diode. This indicates that the diode does not have good limiting properties in the thermal region. As a result, an attempt was made to verify the existence of this phenomenon and to obtain quantitative data. Observations of the transient response of tunnel diodes during high speed (1 nanosecond) switching are discussed with special attention to the lack of limiting. Techniques for measuring diode characteristics are presented. Rise time measurements performed on tunnel diodes and on an analog circuit are discussed. (Author)

AD-257 360 Div. 8
(12 June 61) OTS price $1.60

Seamwell Labs., Inc., Springfield, Va.
HIGH SPEED, HIGH POWER S-BAND PHASE SHIFTER,
by Frederick Fine. Interim development rept. 31 Dec 60-31 Mar 61, 31 Mar 61, 14p. incl. illus.
(Contract NObsr-81265)
Unclassified report

DESCRIPTORS: S band, *Phase shifters, Power supplies, Impedance matching, Impedance, Amplifiers, Attenuation, Standing wave ratios, Electronic circuits, Radar equipment, Design.

Research was conducted in the development of a high speed, high power S band phase shifter. The phase shifter is matched as well as can be expected without a major structural design change. Three hundred and sixty degrees of phase shift was obtained for a movement which should be adequate for speeds approaching 1 millisecond. The electronic drive circuitry and drive unit were designed and built. Operation of the power supplies and amplifier, in preliminary tests was satisfactory. (Author)

AD-257 387 Div. 8, 25
(12 June 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
APPLICATIONS OF TUNNELING TO ACTIVE DIODES.
28 Mar 61, 35p. incl. table (Scientific rept. no. 4a)
(Contract AF 19(604)6623)
(AFCRL-347(a)) Unclassified report

DESCRIPTORS: *Diodes, *Gallium compounds, *Arsenides, Intermetallic compounds, Copper, Semiconductors, Diffusion, Solubility, *Failure (Mechanics), Elasticity, Sulfides, Cadmium compounds, Resistance, Measurement, Impurities, Chemical impurities, Antimony, Germanium, Crystals, Stresses, Arsenic.

The characteristics of forward injection failure in GaAs tunnel diodes are summarized. A model involving rapidly diffusing impurities and junction traps is proposed as the failure mechanism. The diffusion and solubility of Cu in heavily doped GaAs were examined. This impurity is found to diffuse rapidly at low temperatures in p-type GaAs and is suspected of being an important contributor to the failure process. Drift experiments indicated that the rapidly diffusing species is uncharged in p-type material, contrary to expectations. The effectiveness of various procedures for removing Cu from the surface or volume of GaAs specimens have been studied. The dependence of tunneling upon uniaxial strain in Ge was studied, and a theoretical model which qualitatively accounts for the data is presented. The results of some measurements on n-type CdS crystals are reported. (Author)

AD-257 423 Div. 8
(12 June 61) OTS price $3.60

General Electric Co., Syracuse, N. Y.
APPLICATION OF TUNNELING TO ACTIVE DIODES,
by N. Holonyak, Jr. Mar 61, 43p. incl. illus.
(Scientific rept. no. 4b)
(Contract AF 19(604)6623)
(AFCRL-347(b)) Unclassified report

DESCRIPTORS: *Diodes, Semiconductors, Gallium compounds, Arsenides, Crystals, Manganese, Germanium, Growth, Intermetallic compounds, Impurities, Electrical properties, Electron tubes, Alloys, Measurement, Reliability.

A description is given of a simple means of masking against epitaxial GaAs crystal growth on a GaAs seed. The properties of manganese-doped GaAs tunnel diodes are described. An all-germanium-doped GaAs tunnel diode and its properties are described. The dependence of hump tunnel currents upon minority carrier injection in a variety of tunnel diodes is outlined. Some of the measured properties of manganese-doped GaAs are presented. (Author)

AD-257 436 Div. 8
(12 June 61) OTS price $2.60

Radiation Lab., Johns Hopkins U., Baltimore, Md.
A 2 MILLIMETER SUPERHETERODYNE RECEIVER USING A HIGH INTERMEDIATE FREQUENCY,
by G. R. Valenzuela. May 61, 18p. incl. illus. table. (Technical rept. no. AF-88)
(Contract AF 33(616)6753)
Unclassified report

DESCRIPTORS: Intermediate frequency amplifiers, Harmonic oscillators, Noise (Radar), Reduction, Klystrons, Crystal detectors, Amplifiers, Radiofrequency power, *Radar receivers, *Crystal video receivers, Measurement, Design, Crystal mixers, Reflex klystrons.

A superheterodyne receiver for the 2 millimeter range was built using fourth harmonic mixing with a first intermediate frequency of 420 mc. The receiver noise figure, the harmonic mixer noise temperature and harmonic mixer conversion loss were experimentally obtained for first intermediate frequencies of 30, 420, and 500 mc. The results are in agreement with earlier work in this Laboratory. An improvement of receiver noise figure of about 3 db can be obtained by applying a forward dc bias to the harmonic mixer. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-257 450 Div. 8
(12 June 61) OTS price $3.60

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF HIGH POWER GASEOUS ELECTRONICS, by Charles S. Ward. Quarterly progress rept. no. 1, 1 Jan 61-31 Mar 61. 31 Mar 61, 20p. incl. illus. tables.
(Contract DA 36-039-sc-87391, Proj. 3A-99-13-001)
Unclassified report

DESCRIPTORS: Electronic switches, *Plasma physics, Discharge tubes, Electron tubes, *Gas discharges, *Radar duplexers, S band, *Waveguide windows, Waveguides, Electric fields, Argon, Theory, Measurement, Microwave equipment, *Transmit-receive tubes, L band.

Research is being conducted to theoretically and experimentally investigate the nature of high power pulsed microwave plasmas in an effort to better understand and improve microwave gas switching techniques. (Author)

AD-257 476 Div. 8, 25
(12 June 61) OTS price $9.10

Purdue U. School of Aeronautical and Engineering Sciences, Lafayette, Ind.
ON THE PROPAGATION OF WAVES IN AN ELECTRO-MAGNETIC ELASTIC SOLID, by John W. Dunkin and A. Cemal Eringen. Doctoral thesis. May 61. 98p. incl. illus. table, 31 refs.
(Technical rept. no. 18)
(Contract Nonr-110002)
Unclassified report

DESCRIPTORS: *Electromagnetic theory, *Wave transmission, Propagation, Magnetic fields, *Electromagnetic waves, Electrostatic fields, Electromagnetic fields, Electric fields, Elasticity, Equations, Electromagnetism, Mathematical analysis; Solid state physics, Partial differential equations.

The coupling of electromagnetic and elastic waves is considered from the standpoint of linear elasticity and a linearized electromagnetic theory. The problem of plane waves traveling through a uniform magnetostatic field is considered and couplings of the waves are studied. An investigation of the same problem for a uniform electrostatic field shows that the usual plane waves propagate without any change in their phase velocities but that the mechanical waves are accompanied by small fluctuating electromagnetic fields. The problem of the vibration of a free infinite elastic plate in a large magnetostatic field is examined under the assumption that the resulting electromagnetic fields are quasi-stationary. Frequency equations are obtained for both symmetric and antisymmetric vibrations and the damping caused by the field for both the first two symmetric and antisymmetric modes is obtained as a linear correction to the usual free plate frequencies. (Author)

AD-257 485 Div. 8, 5
(12 June 61) OTS price $5.60

Sylvania Electric Products, Inc., Waltham, Mass.
CROSS-COUPLING IN MULTIPLE BEAM ANTENNAS, Scientific rept. no. 1 on Theory of Antenna Performance in Scatter-Type Reception. Apr 61, 1v. incl. illus. tables.
(Contract AF 19(604)7237)
(AFCRL-190) Unclassified report

DESCRIPTORS: *Antennas, *Radio communication systems, Radio signals, Communications theory, Radio waves, Scattering, Diversity systems, Atmosphere, Radio transmission, Antenna couplers, Coupled antennas, Couplings, Transmission lines, Antenna radiation patterns, Perturbation theory, Mathematical analysis, Correlation techniques, Matrix algebra.

This report includes:
CROSS-COUPLING IN MULTIPLE BEAM ANTENNAS. PART I. RADIATION EFFICIENCIES (WITH APPLICATIONS TO ANGLE DIVERSITY) by S. Stein. Apr 61, 1v. incl. illus. (Rept. no. ARM-237)
(Contract AF 19(604)7237)
CROSS-COUPLING IN MULTIPLE BEAM ANTENNAS. PART II. CHARACTERISTICS OF THE CROSS-COUPLING MATRICES, by S. Stein and J. E. Storer. Apr 61, 16p. (Rept. no. ARM-238)
(Contract AF 19(604)7237)

AD-257 486 Div. 8, 25, 26
(12 June 61) OTS price $7.60

Sawyer Research Products, Inc., Eastlake, Ohio.
PILOT PLANT PRODUCTION OF CULTURED QUARTZ, by Baldwin Sawyer. Final rept. 31 Oct 58-31 Jan 61 on Industrial Preparedness Measures on Cultured Quartz. 30 Apr 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-81245)
Unclassified report

DESCRIPTORS: *Quartz crystals, Quartz, *Crystal oscillators, *Optical materials, Light transmission, Optics, Production, Manufacturing methods, Quality control, Sources, Laboratory equipment, Single crystals, Crystals, Spectrographic analysis, Chemical analysis, Industrial production, Growth.

Over 800 lbs of inspected electronic-grade Y crystal bars were cultured from ore taken from 3 domestic quartzite deposits. This material was manufactured into CR23/U oscillators and BG71AH 3 mc frequency standard oscillators. Measurements of oscillator performance showed that this quality was adequate for normal oscillator production, but marginal in Q for high-Q applications. Electronic-grade pure Z growth crystal bars passing inspection in 3 different sizes were cultured from Brazilian No. 1 lascas grade raw quartz. Samples from this material were tested for optical transmittance, and for oscillator properties. A technique was developed and confirmed by test for culturing quartz having high optical transmittance. When pure Z growth cultured quartz was electrolytically purified, material having full Q-capability was produced. (Author)

AD-257 496 Div. 8, 30
(12 June 61) OTS price $4.60

Union Thermoelectric Div., Comptometer Corp., Niles, Ill.
TESTING GUIDE FOR MILITARY QUARTZ CRYSTAL UNITS. May 61. 1v. incl. illus.
(Contract DA 36-039-sc-71061)
Unclassified report

DESCRIPTORS: *Quartz crystals, Tests, *Military requirements, *Specifications, Test methods, Test equipment, Test sets, Crystal holders, Soldering fluxes, Soldering alloys, *Instruction manuals, Materials, Crystals, Electronic equipment, Standards.

CONTENTS:
REQUIREMENTS - General specifications, Definitions, Test sequence, Test equipment, Inspection conditions and methods, and Holders (Dimensions and marking illustrations); INSPECTION - Design and construction, Marking, and Workmanship; VISUAL AND MECHANICAL TESTS - Bond strength, Glass seals, Pin alignment, Plating adherence, and Solder seals; ENVIRONMENTAL TESTS - Shock, Vibration, Leakage, Immersion, Moisture resistance, Salt spray, Temperature cycling, Thermal shock, and Miscellaneous environmental tests; and PERFORMANCE TESTS - Aging, Capacitance, Insulation resistance, Low-drive, Frequency and resistance (constant temperature, frequency drift, and internal pressure), Temperature characteristics, and Unwanted modes tests.

AD-257 498 Div. 8
(12 June 61) OTS price $9.10

Union Switch and Signal Div., Westinghouse Air Brake Co., Pittsburgh, Pa.
DRY CIRCUIT TESTS AND TEST EQUIPMENT FOR ACCEPTANCE TESTING OF RELAYS FOR LOW LEVEL APPLICATION,
by E. R. Dubas. Final engineering rept. 18 Sep 58-18 Sep 60. 1 May 61. 101p. incl. illus. tables.
(Contract AF 33(600)33403)
(AMC TR 61-7-534) Unclassified report

DESCRIPTORS: *Electronic relays, Circuits, Relays, Tests, Test equipment, Reliability, Test methods, Airborne, Life expectancy, *Electronic circuits, *Non-destructive testing, Manufacturing methods, Design, Quality control.

Investigations were made to develop a set of airborne electronic relay acceptance tests which would allow accurate prediction of reliable operating relay life. It was concluded that the general performance and reliability of a relay with respect to surety of contact appears to depend upon two main factors: (1) design and (2) manufacturing processes. Design can reduce or eliminate the problem due to particle contamination by insuring the high contact force and the relatively large amount of contact wipe required to maintain clean contact interfaces. Manufacturing processes can help produce a reliable product by reducing to a minimum the contamination included in each unit during its construction. It is important that those tests which attempt to determine contact reliability maintain operation in the low level area for each total contact operation to obtain the most accurate results; thus, the electrical test parameters must be as low as possible. Four different makes of relays, thought to be representative for hermetically sealed relays, were selected for this study and test. (Author)

AD-257 515 Div. 8, 26
(13 June 61) OTS price $12.00

Briggs Associates, Inc., Norristown, Pa.
ELECTRON TUBE RESEARCH AND DEVELOPMENT STUDIES,
by Thomas H. Briggs and Robert B. Dickson. Final technical rept. for Mar 59-Mar 61. Apr 61, 157p. incl. illus. tables, 12 refs.
(Contract NObsr-77530)
Unclassified report

DESCRIPTORS: *Electron tubes, *Cathodes (Electron tubes), Oxide cathodes, Life expectancy, Tests, Test methods, Reliability, Statistical analysis, Non-destructive testing.

Several methods were studied for evaluating tube performance qualities. Two new methods were considered in detail: (1) shot noise, and (2) dynamic scope test. Data were obtained during 5,000 life test hours on 5816A and 5654 with their commercial equivalents 12AU7 and 6AK5. A group of 5591 tubes (a version of 6AK5) were also compared. The tubes used were free from cathode interface impedance and gas, insofar as their known influence upon life resulted. Shot noise and pulse emission are indicated to be fundamental test methods for cathode activity and capable of allowing tube life burning to be shortened significantly (other variables being under control). This can create major cost savings in proving tube quality. The dynamic scope test was studied in detail and a clarification of the method and its capabilities is presented. It is felt to be a useful tool for presenting and studying tube characteristics and for estimating integrated gas content. (Author)

AD-257 534 Div. 8, 2
(13 June 61) OTS price $8.10

Geophysical Inst., U. of Alaska, College.
AN HF SWEEP FREQUENCY STUDY OF THE ARCTIC IONOSPHERE,
by Howard F. Bates. Apr 61, 59p. illus. (Scientific rept. no. 1; UAG-R115)
(Contracts AF 19(604)1859 and AF 19(604)5574)
(AFCRL-194) Unclassified report

DESCRIPTORS: *Ionosphere, Diurnal variations, *Radio waves, Reflection, High frequency, Ionospheric propagation, Scattering, Radio communication systems, Echo ranging, Magnetic susceptibility, Electrons, Aurorae, Density.

Observations made during 1958 and 1959 using a sweep frequency, HF, oblique sounder located at College, Alaska, are discussed, and selected groups of echoes are illustrated. Groundscatter is the predominant echo type observed on mid-latitude backscatter records, but this is not true in the high latitudes. The majority of the scatter echoes from soundings toward geomagnetic north were direct F region scatter of two main types - 1F and constant range echoes. These same echo types were observed from the E region during magnetic disturbances (the slant Es echo corresponds to the 1F echo). These echoes were centered about geomagnetic north on swept azimuth soundings and were produced by scatter near the oblique reflection point in the ionosphere. Thus, the echoes were caused by scatter from irregularities aligned along the geomagnetic field. (Author)

AD-257 535 Div. 8, 2
(13 June 61) OTS price $1.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
IONOSPHERIC RESEARCH AND PROPAGATION STUDIES,
by H. D. Webb and R. A. Davidson. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 14p. incl. illus.
(Contract DA 36-039-sc-85173, Proj. 3A99-20-001-04) Unclassified report

DESCRIPTORS: *Radio astronomy, Scientific research, *Radio signals, Ionosphere, *Ionospheric propagation, Moon, Radio waves, Reflection, *Electromagnetic wave reflections, Measurement, Satellite vehicles, Installation, Antennas, Radio interference, Calibration, *Solar noise, *Parabolic antennas, Radio receivers, Sun, Stars.

A description of the progress in the construction of the new site and installation of the equipment is given. The site is nearing completion, and the antenna and receiving equipment was placed in operation. Preliminary calibration and operational checks were made. Samples of radio noise from the sun at 151 and 413 mc are presented. Checks of this sort are to be used to check antenna beamwidth and directional accuracy. A sample of radio noise from the radio star Cygnus is presented. A calibration shows the star flux density as about 30 X 10 to the -24th power watts per cycle per square meter. (Author)

AD-257 556 Div. 8
(13 June 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE EFFECT OF A REGENERATIVE LIMITER ON THE RANDOM-NOISE THRESHOLD IN FM SYSTEMS,
by J. J. Downing. Technical rept. on Communications. May 60, 20p. (Rept. no. 6-90-61-1)
Unclassified report

DESCRIPTORS: *Frequency modulation, *Electronic circuits, *Limiters, Signal-to-noise ratio, Noise (Radio), Reduction, Phase shifters, Band pass filters, *Radio signals, Radio receivers, Feedback, Mathematical analysis, Correlation techniques.

Research concerns the suppression of the random-noise threshold effect in FM systems by applying strong regenerative feedback around the amplitude limiter. Little or no threshold suppression is predicted. This conclusion is reached analytically by retaining a nonzero correlation coefficient between the IF and the feedback noise throughout and by introducing a functional expression to take into account the effect of regenerative feedback on results derived by Davenport. A simple conceptual argument is also presented in support of the analytical findings, and some practical aspects of regenerative limiter implementation are considered.. (Author)

AD-257 574 Div. 8
(13 June 61) OTS price $1.10

Oxford U. (Gt. Brit.).
(No title)
Technical rept. for 1 Mar 57-28 Feb 61,
by Ham Motz. 28 Feb 61, 5p. 18 refs.
(Contract AF 61(514)1183)
(AFOSR-824) Unclassified report

DESCRIPTORS: Radiofrequency generators, *Microwaves, *Plasma physics, Propagation, Electron beams, Electron accelerators, *Electromagnetic waves, Great Britain, Scientific research, Theory.

Research was concerned with the exploration of the undulator principle for the generation of submillimeter waves. Other methods for generating such waves were also studied. The objective of the work on millimeter and submillimeter waves is the study of hot plasma. Wave propagation in a plasma was studied theoretically. (Author)

AD-257 596 Div. 8
(12 June 61) OTS price $6.60

SFD Labs., Inc., Union, New Jersey.
RESEARCH ON SUPER POWER MICROWAVE AMPLIFIER,
by H. L. McDowell. Quarterly progress rept. no. 3, 1 Jan 61-1 Apr 61. Apr 61, 61p. incl. illus. tables.
(Contract DA 36-039-sc-85379)
(ARPA Order no. 130-60) Unclassified report

DESCRIPTORS: *Microwave amplifiers, Amplifiers, *Electron tubes, Standing wave ratios, *Space charges, X band, Waveguide couplers, Magnetic fields, Cathodes (Electron tubes), Anodes (Electron tubes), Radiofrequency power, Mathematical analysis, Design, Attenuation, Cold cathode tubes, Materials, Tests, Impedance matching, *Power amplifiers, Coupling circuits.

Research was continued on crossed-field amplifiers. Two new methods of matching to the capacitively strapped slow-wave structure for the SFD-203 were investigated. The best of these had a VSWR of 2:1 or better over a 20% band. This matching arrangement was incorporated into the design for the SFD-203 and construction of the first complete tube was started. A number of experiments using the SFD-202 and a smooth-bore version of the SFD-202 were performed. Information was collected concerning the space charge mode. A program involving 2 types of X-band tubes was instituted to give a direct comparison of forward and backward wave operation and to evaluate the effect of curvature on space charge modes. (Author)

9. FLUID MECHANICS

AD-256 967 Div. 9, 21
(5 June 61) OTS price $1.60

Aerospace Corp., Los Angeles, Calif.
VELOCITY RECOVERY AND SHEAR REDUCTION IN JET-DRIVEN VORTEX TUBES,
by M. L. Rosenzweig. 10 Mar 61, 13p. (Rept. no. TDR-594(1203-01)TN-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Hilsch tubes, *Vortices, *Jets, Velocity, Cylindrical bodies, Turbulent flow, Fluid flow, Nuclear propulsion.

The laminar, two-dimensional flow of a viscous vortex, driven by tangential fluid injection in a porous cylindrical container, is considered. The jets are idealized as sources of mass and momentum. The tangential velocity profile in the annular region between the jet input radius of the cylinder is found analytically as a solution of the tangential momentum equation. The peripheral wall shear is evaluated with and without radial fluid injection through the cylinder wall. For a given tangential velocity in the vortex, radial fluid injection through the porous wall substantially reduces the shear. The effect of radial fluid injection on the fraction of the jet velocity that is recovered in the vortex is found by means of a torque balance, including the torque required to accelerate the radially injected fluid to the peripheral vortex velocity. For a given total mass flow through the center of the vortex, radial fluid injection is always detrimental to the velocity recovery in the vortex; that is, for a given jet velocity, diversion of a fraction of the mass flow from tangential to radial injection always results in a reduced vortex strength. The results for zero radial fluid injection are compared with experimental data for which the flow was turbulent. The theory predicts the recovery accurately even for turbulent flow, provided an appropriate turbulent eddy viscosity is included in the evaluation of the radial Reynolds number. (Author)

AD-257 032 Div. 9, 31
(8 June 61) OTS price $3.60

Hydronautics, Inc., Rockville, Md.
THE EFFECT OF SURFACE WAVES ON SOME DESIGN PARAMETERS OF A HYDROFOIL BOAT,
by Milton Martin and Francis J. Turpin. Jan 61, 14p. illus. (Technical rept. no. 001-3)
(Contract NObs-78396)
Unclassified report

DESCRIPTORS: *Hydrodynamics, Water waves, *Hydrofoil boats, Motion, Wind, Statistical processes, Analysis, Design, Ocean waves, Partial differential equations, Snells law.

A study was made of the effect of the various sea states on flow over hydrofoils to determine the motions of hydrofoil boats, keel clearances and the demands to be made on the controls. Charts were prepared giving expected significant hydrofoil angles of attack and encounter frequencies for various sea states and boat speeds. Curves of expected significant mean wave heights and wave lengths as a function of sea state are given for both fully developed and duration and fetch limited seas. The principal properties of swells and the principal effects of shallow water on the sea state are also discussed. The calculations are based on the reasonable assumption of a Gaussian distribution of the wave amplitudes and the use of Neumann's spectrum, which appears to be the most accurate existing formula that describes the energy spectrum of the short crested sea. (Author)

AD-257 054 Div. 9
(6 June 61) OTS price $3.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
UNSTEADY LIFT AND MOMENT ON FULLY CAVITATING HYDROFOILS AT ZERO CAVITATION NUMBER,
by Milton Martin. Mar 61, 34p. incl. illus. (Rept. no. R-821)
(Contract Nonr-26329)
Unclassified report

DESCRIPTORS: *Hydrofoils, Cavitation, Lift, Moments, *Hydrodynamics, Mathematical analysis, Oscillation, Marine propellers, Gust loads, Differential equations, Partial differential equations, Integral equations, Potential theory.

Expressions are presented for the lift and moment coefficients of a thin supercavitating foil, performing generalized oscillations, in terms of the coefficients of a power series describing the chordwise amplitude distribution. The lift is in general made up of a circulation term, a pure damping term and an added mass term. The circulation term always acts at 5/16 of a chord length aft of the leading edge while the center of pure damping force and added mass depends on the mode of oscillation. The results are applied to the case of a foil moving through a stationary sinusoidal vertical gust and to that of a rigid foil performing heaving and rotational oscillations. (Author)

AD-257 055 Div. 9
(5 June 61) OTS price $11.50

Colorado U., Boulder.
SPIKED BLUNT BODIES IN SUPERSONIC FLOW,
by Hyman H. Album. Master's thesis. June 61, 53p. illus.
(AFOSR-307)
Unclassified report

DESCRIPTORS: *Spikes, Aerodynamics, *Drag, Reduction, *Aerodynamic configurations, Gas flow, Supersonics, Fluid mechanics, Wind tunnels, Cylindrical bodies, *Blunt bodies, Stability.

The force and moment characteristics of spiked bodies with hemispherical, hemispherical-flat, and flat noses were determined in a supersonic wind tunnel at angles of attack from zero to 10 degrees. The afterbodies were right circular cylinders. A fineness ratio of 3 was maintained for all of the basic bodies. The spikes were of five different configurations and ranged in length from 0.75 to 2.0 body diameters. Free-stream conditions included Mach numbers from 2.0 to 3.0 and Reynolds numbers from 300,000 to 900,000 (based on body diameter). It was found that the spikes greatly reduced the zero-angle drag, made the drag extremely sensitive to angle of attack variations, substantially increased the lift, and also increased the normal force. The body nose shape proved to be a critical factor in determining the magnitude of these characteristics and whether or not the spikes would have a stabilizing effect on the body pitching moment characteristics. (Author)

AD-257 060 Div. 9
(5 June 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
APPLICATION OF MONTE CARLO TECHNIQUE FOR DETER-

Division 9 - FLUID MECHANICS

MINING MANEUVERING LOADS FROM STATISTICAL INFORMATION ON AIRPLANE MOTIONS,
by Harold A. Hamer, John P. Mayer, and Wilber B. Huston. May 61, 43p. incl. illus. tables (Rept. no. TN-D-524)

Unclassified report

Also available from NASA, Washington 25, D. C. as NASA Technical note D-524.

DESCRIPTORS: *Jet fighters, *Jet planes, Fighters, *Airplanes, Statistical analysis, Load distribution, *Stabilizers (Horizontal tail surfaces), Maneuverability, Flight testing, Numerical methods and procedures.

A statistical analysis of horizontal-tail loads was made from measurements obtained on a fighter airplane during operational training. The flights covered altitudes up to about 50,000 feet and Mach numbers up to 1.22. The analysis was performed to determine the feasibility of calculating horizontal-tail load from data on the flight conditions and airplane motions. Loads were calculated by two methods, a direct approach and a Monte carlo technique, and were compared with the measured loads for each type of mission performed during the flight investigation. (Author)

AD-257 061 Div. 9
(5 June 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
CALCULATED NORMAL LOAD FACTORS ON LIGHT AIRPLANES TRAVERSING THE TRAILING VORTICES OF HEAVY TRANSPORT AIRPLANES,
by William A. McGowan. May 61, 58p. incl. illus. tables, 17 refs. (Rept. no. TN-D-829)

Unclassified report

Also available from NASA, Washington 25, D. C. as NASA Technical note D-829.

DESCRIPTORS: *Vortices, *Transport planes, *Airplanes, Elevators, Hazards, Wake, Load distribution, Mathematical analysis, *Aerodynamics, Control surfaces, Differential equations.

Results are presented of normal-load-factor calculations made for a light normal-category airplane and a light transport-category airplane traversing the wing-tip rolled-up trailing vortices of each of three heavy transport airplanes. The normal load factors were determined for several penetration paths lying in a plane perpendicular to the trailing vortices and for three light-airplane center-of-gravity locations and velocities. The methods used (formulated from available theories) and an example illustrating use of derived charts for computing normal load factors are included. (Author)

AD-257 095 Div. 9, 25
(7 June 61) OTS price $4.60

Illinois U., Urbana.
ANALYTICAL STUDY OF THE BEHAVIOUR OF FLUIDS IN POROUS SOLID MEDIA,
by Walter Rose. Quarterly progress rept. no. 7, 1 Mar-31 May 60. 1 June 61, 1v. incl. illus. table.
(Contract DA 18-108-405-cml-517)

Unclassified report

DESCRIPTORS: *Fluids, *Fluid mechanics, Capillaries, Porous materials, Solids, Partial differential equations, Wetting agents, Surfaces, Viscosity, *Capillary tubes, Motion picture film, *Fluid flow, Liquids, Digital computers, Programming.

Progress is reported for work accomplished on the following phases: (1) a restatement of the problem of capillary flow; (2) an analysis of the meaning and application of the Brittin equation; (3) further development of the network model procedure of study, including machine programming and experimental aspects; and (4) determination of the velocity and acceleration dependency in the measurement of contact angle of moving fluid-fluid interfaces. (Author)

AD-257 100 Div. 9, 25
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONTRIBUTIONS TO THE THEORY OF SURFACE WAVES IN MAGNETIC HYDRODYNAMICS (K Teorii Poverkhnostnykh Voln V Magnitnoy Gidrodinamike),
by A. D. Kislovskiy. Oct 60, 10p. (Trans. no. F-TS-9754)

Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Theory, Liquids, Wave characteristics, Wave transmission, Velocity, Gravity, Magnetic fields, Bessel functions, Surface properties, Series.

AD-257 103 Div. 9, 25
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CERTAIN PROBLEMS CONCERNING THE THEORY OF HEAT EXCHANGE IN THE LAMINAR FLOW OF A FLUID IN PIPES (Nekotoryye Voprosy Teorii Teploobmena Pri Laminarnom Techenii Zhidkosti V Trubakh),
by D. A. Lavuntsov. Jan 61. 15p. incl. illus. table (Trans. no. F-TS-9958 from Teploenergetika 3:55-60, 1958)

Unclassified report

DESCRIPTORS: *Pipes, Laminar boundary layer, *Fluid flow, *Heat transfer, Theory, Mathematical analysis, Differential equations, Series, Integral equations, Hydrodynamics, Heat exchangers.

Heat transfer in a hydrodynamically stabilized laminar flow is analyzed. A general solution of the constant heat input is supplied, which makes it possible to calculate the length of the heat-stabilization sector. Furthermore, the effect of axial heat conduction in the flow on the heat emission at a constant temperature of the pipe wall and also at a constant heat input was studied. (Author)

AD-257 110 Div. 9
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
WAYS OF DEVELOPING MODERN AERODYNAMICS (Puti Razvitiya Sovremennoy Aerodinamiki),
by V. Votyakov and B. Shumyatskiy. Oct 60, 6p. incl. illus. (Trans. no. MCL-116 from Sovetskaya Aviatsiya (Periodical) 67, 21 Mar 59)

Unclassified report

DESCRIPTORS: *Aerodynamics, *Supersonics, Theory, Thermodynamics, Heat transfer, Air, *Hypersonics, Shock waves, *Boundary layer, Chemical properties, Gas ionization, *Superaerodynamics, Technological intelligence, USSR.

AD-257 176 Div. 9, 15
(5 June 61) OTS price $2.60

Bergen U. (Norway).
MATHEMATICAL THEORY OF TURBULENCE. PART I. ASYMPTOTIC EXPANSIONS IN WALL-LAW LAYER,
by Oddvar Bjorgum. July 60. 24p. (Technical Scientific note no. 2)
(Contract AF 61(052)275)
(AFCRL TN-60-673) Unclassified report

DESCRIPTORS: *Turbulence, Series, Partial differential equations, Boundary layer, *Turbulent flow, *Turbulent boundary layer, Laminar boundary layer, Reynolds number, Drag, Friction, Velocity, Mathematical analysis, Sheets.

In the case of a linear differential equation an expansion in powers of a parameter may be multiplied by any power of that parameter and still be a solution of the differential equation. In general, this is not so in the case of non-linear differential equations. In the present paper this fact is exploited to derive possible asymptotic expansions compatible with Navier-Stokes equations in wall-law layer of stationary turbulent flows, i.e. turbulent flows in which all properly averaged quantities remain stationary. Three types of stationary turbulent flow are considered, (i) the flow between two parallel plane walls in relative motion, (ii) pressure flow between parallel plane walls at rest, and (iii) boundary layer along a flat plate. It is found that two essentially different asymptotic expansions are compatible with Navier-Stokes equations. One of these expansions may yield the above wall law whereas the other yields a possible wall law which indicates the possibility of a type of turbulent flow which is different from that found in ordinary laboratory experiments. In either case the differential equations are the same in all three types of flow considered, thus indicating the same wall law in all three cases. (Author)

AD-257 177 Div. 9, 15
(5 June 61) OTS price $3.60

Bergen U. (Norway).
SOME CONSIDERATIONS ON POSSIBLE CALCULATIONS CONCERNING SUB-SONIC SHEAR-FLOW TURBULENCE,
by Oddvar Bjorgum. June 60, 34p. (Technical Scientific note no. 1)
(Contract AF 61(052)275)
(AFCRL TN-60-672) Unclassified report

DESCRIPTORS: *Shear stresses, Fluid flow, Gas flow, *Subsonic flow, Mathematical analysis, *Turbulent flow, Operators (Mathematics), Velocity, Numerical analysis, Statistical functions, Series, Integral equations, Reynolds number, Differential equations, Tensor analysis, Determinants, Probability, Partial differential equations, *Turbulence.

The problems considered in this paper are (a) the theoretical determination of the mean velocity profile of a simple stationary turbulent shear flow and (b) the determination of the lowest critical Reynolds number for which such a turbulent flow is possible. The general case of three-dimensional fluctuations is considered. (Author)

AD-257 194 Div. 9, 25
(7 June 61) OTS price $5.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
A THERMAL RAYLEIGH PROBLEM IN A VISCOUS RELAXING GAS,
by J. T. Curtis and W. E. Gibson. April 61, 45p. incl. illus. tables (Rept. no. AF-1285-A-6)
(Contract Nonr-265300)
Unclassified report

DESCRIPTORS: *Gas flow, Heat transfer, *Relaxation time, Diffusion, *Hypersonic flow, *Viscosity, Boundary layer, *Thermal diffusion, *Superaerodynamics, Hypersonics, Excitation, Molecules, Atoms, Partial differential equations, Differential equations.

A one-dimensional analog of certain nonequilibrium boundary layer problems is studied theoretically. By the imposition of a weak temperature jump at the bounding plane, a viscous wave is produced in a semi-infinite region filled with a gas initially in a state of equilibrium. Finite reaction rates and wall catalycity are assumed. Linearized equations, applicable to either vibrational or dissociative relaxation, are derived for a diffusive process and are solved exactly for the special case of the Lewis number equal to one. The effect of small departures of the Lewis number from one has also been investigated. (Author)

AD-257 278 Div. 9
(9 June 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL DETERMINATION OF THE RECOVERY FACTOR AND ANALYTICAL SOLUTION OF THE CONICAL FLOW FIELD FOR A 20 DEGREE INCLUDED ANGLE CONE AT MACH NUMBERS OF 4.6 AND 6.0 AND STAGNATION TEMPERATURES TO 2600 DEGREES R.
by Frank A. Pfyl and Leroy L. Presley. June 61. 64p. incl. illus. tables, 35 refs. (Technical note D-353)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-353.

DESCRIPTORS: *Conical bodies, *Supersonics, Bodies of revolution, Mathematical analysis, *Hypersonics, *Aerodynamics, Heat transfer, Thermodynamics, Differential equations, Aerodynamic configurations, Reynolds number, Enthalpy.

The Reynolds number range of the tests conducted at the high temperatures fell in the slip-flow regime. The results indicated, generally, that the recovery factor can be predicted satisfactorily using the square root of the Prandtl number. The recovery data also indicated two definite trends: one of decreasing recovery factor with decreasing pressure, and one of decreasing recovery factor with increasing temperature. (Author)

AD-257 279 Div. 9
(9 June 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC LOADS AT MACH NUMBERS FROM 0.70 TO 2.22 ON AN AIRPLANE MODEL HAVING A WING AND CANARD OF TRIANGULAR PLAN FORM AND EITHER SINGLE OR TWIN VERTICAL TAILS,
by Victor L. Peterson and Gene P. Menees. June 61, 57p. incl. illus. tables (Rept. no. NASA TN D-690)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-690.

Division 9 - FLUID MECHANICS

DESCRIPTORS: *Aerodynamics, *Transonics, *Supersonics, Load distribution, *Wing-body configurations, *Supersonic planes, *Canard configuration, Aerodynamic configurations, Triangular wings, Lift, Drag, Moments, Pressure, Fins, Model tests.

Results of an investigation of the aerodynamic loads on a canard airplane model are presented without detailed analysis for the Mach number range of 0.70 to 2.22. The model consisted of a triangular wing and canard of aspect ratio 2 mounted on a Sears-Haack body of fineness ratio 12.5 and either a single body-mounted vertical tail or twin wing-mounted vertical tails of low aspect ratio and sweptback plan form. The body, right wing panel, single vertical tail, and left twin vertical tail were instrumented for measuring pressures. Data were obtained for angles of attack ranging from -4 degrees to +16 degrees, nominal canard deflection angles of 0 degrees and 10 degrees, and angles of sideslip of 0 degrees and 5.3 degrees. The Reynolds number was 2.9 x 10 to the 6th power based on the wing mean aerodynamic chord. (Author)

AD-257 280 Div. 9, 12
(9 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
STATIC LONGITUDINAL AERODYNAMIC CHARACTERISTICS AT TRIANGULAR PYRAMIDAL LIFTING REENTRY CONFIGURATION FOR ANGLES OF ATTACK UP TO 110 DEGREES,
by John P. Mugler, Jr., and Walter B. Olstad. June 61, 38p. incl. illus. tables. (Technical note D-797)

Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-797.

DESCRIPTORS: *Transonics, *Aerodynamics, *Re-entry vehicles, *Blunt bodies, Drag, Stability, Stability (Longitudinal), Lift, Pressure, Moments, *Supersonics, Reynolds number, Aerodynamic configurations, Model tests.

The static longitudinal aerodynamic characteristics of a blunted right triangular pyramidal lifting reentry configuration have been obtained at Mach numbers from 0.60 to 1.20 and angles of attack from 0 degrees to 110 degrees. The test Reynolds number, based on the mean geometric chord, varied during the tests from about 2.2 x 10 to the 6th power to 5.7 x 10 to the 6th power. The results indicate that the model was statically longitudinally stable near 0 degrees and 90 degrees angle of attack; however, the onset of pitch-up caused unstable or neutrally stable regions between angles of attack of about 25 degrees to 50 degrees. Maximum lift-drag ratios of about 2.4 were obtained at subsonic speeds and then diminished to about 1.6 at low supersonic speeds. Comparisons with data from other tests indicate that blunting the nose, leading edge, and ridge line had little effect on the maximum lift-drag ratio. (Author)

AD-257 305 Div. 9, 31
(9 June 61) OTS price $2.60

Berlin Towing Tank (Germany).
ON OSCILLATING HYDROFOILS. PART I,
by S. Schuster and H. Schwanecke. Dec 60, 17p. illus. tables.
(Contract N62558-2236)

Unclassified report

DESCRIPTORS: *Hydrofoils, Oscillation, Fluid flow, Lift, Hydrofoil boats, Tests, Mathematical analysis, Hydrodynamics, Integral equations, Design.

The results of the tests for the steady state confirm generally speaking the prediction of the theory in the case of the flat foil. The influence of the aspect ratio and of the water surface on dihedral foils may be evaluated approximately. Therefore it can be assumed that the fundamental physical considerations are logical, and that they represent a convenient basis for any theoretical examination of nonsteady processes. The results of the tests of the nonsteady state do not yet permit any substantial conclusions for at the moment neither the speed of travel nor the direction of propagation of the waves was varied. (Author)

AD-257 324 Div. 9
(9 June 61) OTS price $1.60

Princeton U., N. J.
PRELIMINARY REPORT ON THE THEORETICAL TREATMENT OF THE TWO-DIMENSIONAL GROUND EFFECT MACHINE IN FORWARD MOTION,
by H. J. Davies. Jan 61, 10p. illus. (Rept. no. 533)
(Contract DA 44-177-tc-524, Proj. 9-38-01-000)

Unclassified report

DESCRIPTORS: Ground effect, Mathematical analysis, *Flying platforms, Integral equations, *Aerodynamics, Jets, Jet mixing flow, Transformations (Mathematics), Potential theory.

An idealized model of a two dimensional ground effect machine in forward motion is treated theoretically. Ideal potential flow is assumed and the Schwartz-Christoffel transformation is used to obtain the flow equations. A symmetrical model about the mid-point is assumed with jets tilted inward. (Author)

AD-257 381 Div. 9
(12 June 61) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
INVESTIGATION OF BOUNDARY-LAYER SUCTION ON A 20-CALIBER OGIVE CYLINDER AT MACH NUMBERS 2.5, 3.0, 3.5, AND 4.0,
by W. T. Strike and S. Pate. June 61, 30p. incl. illus. table (AEDC TN 61-66)
(Contract AF 40(600)800, Proj. 1366)

Unclassified report

DESCRIPTORS: Supersonics, Effectiveness, *Boundary layer control, *Suction slots, Test methods, *Bodies of revolution, *Ogives, Drag, Supersonic wind tunnels, Wind tunnel models, Model tests, *Cylindrical bodies, Supersonic flow, Instrumentation.

A second investigation was conducted in the 12-in., intermittent, supersonic wind tunnel of the von Karman Gas Dynamics Facility to measure the effectiveness of boundary-layer suction on a 20-caliber ogive cylinder. The application of suction type boundary-layer control on the ogive was investigated at Mach numbers 2.5, 3.0, 3.5, and 4.0 over a unit Reynolds number range from 0.07 to 1.03 x 10 to the 6th power per inch with the model at zero angle of attack. Some additional data were obtained at 2-deg angle of attack at Mach number 3. As a result of improving the design of the suction system a significant gain was made in reducing the net drag of the model at Mach number 3 by boundary-layer suction. The presence of the suction slots with no suction when compared with the sealed slot configuration (that is, smooth model) had some influence on the boundary-layer characteristics at all Mach numbers. (Author)

AD-257 396 Div. 9, 25, 27
(12 June 61) OTS price $2.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
EXACT SOLUTIONS FOR NONEQUILIBRIUM EXPANSIONS OF AIR WITH COUPLED CHEMICAL REACTIONS,
by Alan Q. Eschenroeder, Donald W. Boyer, and J. Gordon Hall. May 61, 21p. incl. illus. tables, 14 refs. (Rept. no. AF-1413-A-1)
(Contract AF 49(638)792 and AF 40(600)804)
(AFOSR 622) Unclassified report

DESCRIPTORS: Thermodynamics, Thermochemistry, *Reaction kinetics, *Gas flow, Gases, *Rocket motor nozzles, Dissociation, Recombination reactions, Chemical reactions, Air, *Oxygen, *Nitrogen, Atoms, Nitrogen compounds, Oxides, Hypersonic nozzles, Chemical equilibrium, Enthalpy, Shock waves, Hypersonic flow, Hypersonic wind tunnels, *Rocket propulsion, Pressure, Argon, Exchange reactions.

Results of numerical integrations of the coupled chemical rate equations and gasdynamic equations are presented for nozzle airflows. Composition histories are shown for a kinetic mechanism including 6 species and 14 reactions. The freezing process is complex because the N-O shuffle reactions couple the disociation-recombination reactions. In many cases where the energy in N dissociation is significant, the fast shuffle reactions prevent N atom freezing which would otherwise occur if 3 body recombination were the only process operating. Nitric oxide concentrations undershoot the equilibrium values in many cases. Oxygen freezing is affected little by the shuffle reactions. Results suggest the applicability of simplified chemical kinetic models based on the shuffle reactions for airflows in various regimes of the initial state. (Author)

AD-257 404 Div. 9
(12 June 61) OTS price $6.60

California Inst. of Tech., Pasadena, Calif.
VECTOR VELOCITY FLUCTUATIONS OF PROPAGATING STALL IN AXIAL FLOW COMPRESSORS,
by Charles A. Bodeen. Thesis. 1961, 62p. incl. illus. tables, 25 refs.
Unclassified report

DESCRIPTORS: Stalling, *Axial flow compressors, Compressors, Tests, Velocity, Instrumentation, Mensurement, Airfoils, *Aerodynamics, *Anemometers.

The angular velocity of propagation of a single cell partial span propagating stall traveling on an isolated, or relatively isolated, axial compressor blade row was found experimentally to be equal to the downstream angular velocity of the flow outside the stall cell between successive passages of the stall cell averaged over the blade span. In a machine consisting of three stages, a similar stall was found to propagate at the mean of two such averages, i.e., upstream and downstream from any interior blade row. The sides of partial span stall cells were found to be streamtubes in several cases. Other general but less significant observations of propagating stall are reported. The hot wire anemometers used to measure unsteady vector velocities are described. (Author)

AD-257 424 Div. 9
(12 June 61) OTS price $6.60

General Applied Science Labs., Inc., Hempstead, N. Y.
PROPELLER SINGING ANALYSIS,
by L. Arnold, F. Lane, and S. Slutsky. Final rept. 1961. 69p. (Technical rept. no. 221)
(Contract Nonr-274500)
Unclassified report

DESCRIPTORS: *Marine propellers, Mathematical analysis, *Hydrofoils, Vortices, Stalling, Flutter, Underwater sound, Acoustics, Integral equations, Differential equations, Lift, Drag, Moments, Boundary layer, Vibration, *Hydrodynamics, Oscillation, Pressure, Elasticity, Deformation, Trim tabs, Wings, Underwater sound transmission.

A theoretical investigation is presented of the phenomenon of singing of moving hydrofoil vanes or blades. The experimentally noted dependence of Strouhal frequency on blade thickness, boundary layer thickness and vibration amplitude is taken into consideration in formulating an expression for the hydrodynamic forces acting on the blade. The unsteady hydrodynamic forces associated with an oscillating blade are generalized by relinquishing the Kutta condition of boundedness of pressure jump at the blade trailing edge. Curves of frequency and amplitude versus velocity were obtained which bear good qualitative resemblance with available experiment. The effect of trailing edge thickness is also examined and indicates frequency and amplitude effects consistent with experiment. The sound field intensity and distribution is discussed and an estimate obtained. (Author)

AD-257 451 Div. 9
(12 June 61) OTS price $3.60

Mississippi State U., State College.
AN EXAMINATION OF FULLY DEVELOPED TURBULENT FLOW IN A SQUARE DUCT,
by John C. Mauer. 12 May 61. 32p. incl. illus. tables (Research rept. no. 33)
(Contract Nonr-97801)
Unclassified report

DESCRIPTORS: *Turbulent flow, Measurement, Fluid flow, *Ducts, Velocity, Wake, Pressure, Test equipment, Partial differential equations, Mathematical analysis.

The problem of describing the velocity profiles and other flow data in a square duct was investigated using the boundary layer description due to Cornish, The existence of a negative local free stream velocity with components due to wake over the friction velocity function was discovered and a method of describing the profile as a function of its position within the pipe was deduced. A method was determined to predict total quantity flow in a square duct as a function of both centerline velocity and static pressure loss down the duct. Profiles were measured at a wide range of centerline velocities, and the theories were verified experimentally. (Author)

AD-257 500 Div. 9, 25
(12 June 61) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON VARIATIONAL PRINCIPLES FOR NON-NEWTONIAN FLUIDS,
by M. W. Johnson, Jr. November 60. 18p. incl.
(MRC Technical summary rept. no. 208)
(Contract DA 11-022-ORD-2059)
Unclassified report

Paper presented at the thirty-first annual meeting of the Society of Rheology, Mellon Inst., Pittsburgh, Pa., Oct 31-Nov 2, 1960.

DESCRIPTORS: *Fluid flow, Partial differential equations, Tensor analysis, Differential equations, *Fluid mechanics, Velocity, Deformation, Stresses, Turbulence, Mathematical analysis, Integral equations.

AD-257 566 Div. 9
(13 June 61) OTS price $4.60

New York U. Coll. of Engineering, N. Y.
ATTEMPTS AT DERIVATION OF TRANSITION FROM LAMINAR INTO TURBULENT FLOW ALONG A FLAT PLATE,
by H. F. Ludloff and D. F. DeSanto. Final rept. Nov 60, 39p. incl. illus. tables, 11 refs.
(Contract AF 18(603)25)
(AFOSR-722) Unclassified report

DESCRIPTORS: *Turbulent flow, Partial differential equations, *Numerical analysis, Transport properties, Turbulent boundary layer, Vortices, Sheets, Laminar boundary layer, Turbulence, Difference equations, Linear systems, Non-linear systems, Fluid flow, Thickness, Perturbation theory.

Research has resulted in the derivation of a numerical scheme for the solution of the complete Navier-Stokes equations for two-dimensional time-dimensional time-dependent viscous incompressible flow, as applied to the problem of the development of turbulence in the laminar boundary layer on a flat plate. The basic equations are reduced to a single quasi-linear vorticity-transport equation plus a Poisson equation; these are then written in finite-difference form. The solution of the difference system comprises a semi-implicit scheme for the quasi-linear equation together with an extrapolated line-Liebmann iteration method for the linear Poisson analog. Solutions for the two cases investigated (very low amplitude linear and very high amplitude nonlinear) are presented and discussed. The numerical scheme is demonstrated to be stable and capable of generating solutions which exhibit major theoretical and/or experimentally-observable features for each of the two cases. (Author)

AD-257 567 Div. 9
(13 June 61) OTS price $4.60

New York U. Coll. of Engineering, N. Y.
NUMERICAL STUDIES OF TRANSITION FROM LAMINAR TO TURBULENT FLOW OVER A FLAT PLATE,
by D. F. DeSanto and H. B. Keller. Final rept. Apr 61, 45p. incl. illus. tables.
(Contract AF 18(603)25; In cooperation with Institute of Mathematical Sciences, N. Y., Contract AF 49(638)446)
(AFOSR-723) Unclassified report

DESCRIPTORS: *Boundary layer, *Fluid flow, Laminar boundary layer, Turbulent boundary layer, *Fluid mechanics, Turbulent flow, Sheets, Turbulence, Mathematical analysis, Difference equations, Hydrodynamics, Motion, Equations, Numerical analysis.

A finite-difference technique is developed for analyzing the time-dependent two-dimensional flow of an incompressible viscous fluid over a semi-infinite flat plate. The complete (non-linear) equations of motion for perturbed Blasius flow are numerically integrated with respect to time, and the propagation of disturbances in the boundary layer is determined. An analysis of the theoretical convergence and stability properties of the difference scheme is carried out. The method developed has been employed in two test calculations, in which slightly unstable oscillatory disturbances have been introduced at some upstream point. The numerical solutions exhibit many of the major theoretical and experimentally observed features associated with transition from laminar to turbulent boundary-layer flow. (Author)

10. FUELS AND COMBUSTION

AD-256 905 Div. 10, 25
(2 June 61) OTS price $19.75

Guggenheim Aeronautical Lab., Calif. Inst. of Tech., Pasadena.
FUNDAMENTAL STUDIES RELATING TO SYSTEMS ANALYSIS OF SOLID PROPELLANTS,
by M. L. Williams, P. J. Blatz, and R. A. Schapery. Final rept. Feb 61, 295p. incl. illus. tables, 98 refs. (Rept. no. GALCIT SM 61-5)
(Subcontract to Redstone Div., Thiokol Chemical Corp., Contracts DA 01-021-ORD-11919, DA 01-021-ORD-780, DA 01-021-ORD-5314 and Thiokol Chemical Corp., Brigham City, Utah, Contract AF 33(600)36514)
(Rept. no. 23-61) Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellant grains, Analysis, Structures, Viscosity, *Elasticity, Mechanical properties, Stresses, Deformation, Failure (Mechanics), Fracture (Mechanics), Tests, Theory, Mathematical analysis, Relaxation time, Equations, Temperature, Physical properties.

A description is presented of the type of structural complications introduced by a viscoelastic material to provide background information for evaluating the structural integrity of a solid propellant rocket grain. From the engineering standpoint the problem areas were separated into 3 categories: (1) characterization of material properties; (2) analysis procedures; and (3) failure criteria. The assumptions under which the analysis was made are that: (1) the viscoelastic medium is isotropic, homogeneous, and continuous; (2) deformations are sufficiently small to be considered infinitesimal; (3) inertia forces, due to straining, are neglected; and (4) idealized geometries are considered for which analytical solutions may be obtained. Discussions on material characterization include the operational concept for stress-strain relations, linear viscoelastic and model representation, spectral distribution functions, temperature-time shift phenomena, and mechanical property determination.

AD-256 925 Div. 10
(2 June 61) OTS price $1.60

Bureau of Mines, Pittsburgh, Pa.
RESEARCH ON THE FIRE AND EXPLOSION HAZARDS ASSOCIATED WITH NEW LIQUID PROPELLANTS,
by David Burgess, Joseph Grumer, and Michael G. Zabetakis. Progress rept. no. 8, 1 Feb-30 Apr 61. 30 Apr 61, 7p. illus.
(Contract NAonr-8-61)
Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Hydrazines, *Methyl hydrazines, Tetroxides, Amines, Nitrogen compounds, Dioxides, Ignition, Oxides, Combustion, Flame propagation, Detonation, *Rocket fuels, Gases, *Explosions, Spark ignition, Temperature, Oxygen, Ethylene, Test facilities, *Fires, *Hazards.

The fuels studies included N2H4, MMH, and UDMH. Spontaneous ignition temperatures (S.I.T.) of liquid monomethyl hydrazine (MMH), N2H4, and UDMH in various NO2 - air atmospheres were determined for several liquid fuel temperatures. Results showed that the S.I.T. for UDMH and N2H4 at any fixed concentration of NO2 decreased with increased fuel temperature. S.I.T. curves for liquid MMH at 36, 55 and 67C indicated a decreasing S.I.T. with decreasing liquid temperature. Detonation and flame propagation studies of a 20% UDMH-O mixture indicated a peak pressure in the experiment of about 330 psi; propagation ion velocities are comparable to those obtained with ethylene-O mixtures. Minimum energy requirements under the same test conditions to produce ethylene-O and UDMH-O detonations are 11.5 and 10.5 joules, respectively. The mechanics of the central initiation-detonation test procedure are described.

AD-257 018 Div. 10
(5 June 61) OTS price $1.10

Princeton U., N. J.
BURNING RATE CONTROL FACTORS IN SOLID PROPELLANTS,
by Kimball P. Hall and E. Karl Bastress. Quarterly technical summary rept. no. 9, 1 Jan-31 Mar 61. 15 May 61, 5p. illus. (Aeronautical engineering rept. no. 446-i)
(Contract Nonr-185832, Proj. NR 098-201)
(ARPA order no. 23-59 and 23-60)
Unclassified report

DESCRIPTORS: *Solid rocket propellants, *Propellant grains, *Rocket oxidizers, Perchlorates, Sulfides, Polymers, Binders, Acrylic resins, Butadienes, Aluminum, Particles, Combustion, Pressure, Casting, High pressure research, Test equipment, Vacuum apparatus, Processing.

Programs under development include: (1) effects of oxidizer particle size in polysulfide propellants; (2) relation between binders (polybutadiene-acrylic acid) and burning characteristics; (3) propellant burning rates at high pressures; and (4) Al propellant burning rates. New apparatus were manufactured for vacuum casting of uncured propellant. The propellant mold is placed on a table which is vibrated by an electro-magnetic vibrator. The entire apparatus is enclosed in a bell jar. A new strand burner was developed with the following features: (1) incorporation of upward flow of N purge gas around the burning strand to increase precision of burning rate measurements; (2) operating temperatures between -100 and 300 F; and (3) burning rate measurements at the rate of 5 or more per hour.

AD-257 120 Div. 10
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FUEL FOR COSMIC SHIPS (Toplivo Dlya Kosmicheskikh Korabley),
by P. Petunin. 21 Oct 60, 5p. (Trans. no. MCL-360 from Komsomol'skaya Pravda, p. 4, 22 Aug 59)
Unclassified report

DESCRIPTORS: *Rocket fuels, Solid rocket propellants, Liquid rocket propellants, Rocket oxidizers, Spaceships, Metals, Liquefied gases, Internal combustion engines, Rocket propulsion, Propulsion, Theory, Thermochemistry, USSR, Recombination reactions, Ion rockets, Space flight.

AD-257 142 Div. 10, 4
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RELATION BETWEEN THE RATE OF COMBUSTION OF INDIVIDUAL HYDROCARBONS AND ETHERS AND THEIR STRUCTURE (O Zavisimosti Skorosti Vygoraniya Individual'Nykh Uglevodorodov I Zfirov Ot Nkh Stroeniya),
by V. V. Makarenkov, A. P. Meshcheryakov and others. Oct 60. 11p. incl. illus. tables, 11 refs. (Trans. no. MCL-577 from Izvestiya Vysshikh Uchebnykh Zavedeniy, Neft' I Gaz 4:71-78, 1959)
Unclassified report

DESCRIPTORS: *Hydrocarbons, *Ethers, Monocyclic compounds, Polycyclic compounds, Molecular structure, Molecular weight, Combustion, Low pressure research, Benzenes.

The combustion rates of individual hydrocarbons and ethers have been investigated on a Bunsen burner at 150 mm Hg pressure in laminar flow. The difference in the combustion rates of hydrocarbons with the same number of C atoms, but belonging to different classes, has been demonstrated. It has been shown that, in a homologous series of alkanes of normal structure (with up to 10 C atoms in the molecule) and in the ethers, the combustion rate decreases linearly with increasing molecular weight. Molecules of alkanes of branched structure have a higher combustion rate than molecules of normal structure, with the same molecular weight. Molecules with a double bond have a higher rate of combustion than molecules having the same structure but no double bonds. (Author)

AD-257 143 Div. 10
(2 June 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CHEMISTRY, TECHNOLOGY AND CALCULATION OF THE PROCESSES OF MOTOR FUEL SYNTHESIS (Khimiya, Tekhnologiya I Raschet Protsessov Sinteza Motornukh Topliv),
by N. F. Nagiyev. Oct 60. 40p. incl. illus. tables, 28 refs. (Trans. no. MCL-578 from Izdatel-stvo Akademii Nauk SSSR, Moskva-1:65-95, 1955)
Unclassified report

DESCRIPTORS: *Jet engine fuels, Synthesis, *Fuels, Jet engines, Turbojet engines, Hydrocarbons, Oxidizers, Fuel additives, Physical properties, Chemical properties, Gas turbines, *Aviation fuels, USSR, Polymerization.

Various fuels were evaluated with respect to their possible use in gas turbines. The following characteristics were used as a basis: (1) pumping properties of the fuel under any operating conditions; (2) dependable starting of the engine at low temperatures; (3) stability of burning under any conditions; (4) highest possible heat value; (5) smallest possible size of combustion zone; (6) smallest possible harmful influence of the combustion products on the walls of the chamber and the turbine blades; and (7) safety of the fuel. A detailed description is given of the physical and chemical properties of hydrocarbons that enter into a modern fuel composition and those of the alkene hydrocarbons, which may be used as fuel components in the future. For producing jet fuels the development of alkylation, polymerization, and other processes is recommended in order to obtain products which boil in the same range (65 to 300 C) but are more suitable fuels for modern jet aircraft.

Division 11 - GROUND TRANSPORTATION EQUIPMENT

AD-257 144 Div. 10, 4, 14
(2 June 61) OTS price $4.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF THE COMPOSITION OF THE LIGHT FRACTIONS OF SOVIET CRUDES (Issledovaniye Sostava Legkikh Fraktsiy Sovetskikh Nefty),
by A. V. Topchiyev, B. A. Kazanskiy and others.
Oct 60. 40p. 160 refs. (Trans. no. MCL-580 from Uspekhi Khimii; Izdatel'Stvo Akademii Nauk 27: 1177-1197, 1958)
Unclassified report

DESCRIPTORS: *Petroleum, *Hydrocarbons, *Fuels, *Aviation fuels, *Kerosene, Oils, Mineral oil, Lubricants, Gasoline, Airplane engine oils, Petroleum industry, Production, Processing, Fractionation, Spectrographic analysis, Chemical analysis, Chromatographic analysis, USSR.

A survey of the principal work on analysis of the light fractions of USSR crudes is presented. In connection with USSR development of the construction of aircraft and automobile engines and expansion of the chemical industry, it became necessary to make detailed studies of the hydrocarbon composition of the benzene-kerosene fractions of petroleum. The study of the structure and properties of the hydrocarbons contained in petroleum fractions and petroleum products is necessary for the selection and development of fuels. To solve the problem of the extraction of petroleum, it is essential to deepen and broaden the experimental data on the nature, concentration, and structure of the hydrocarbon and non-hydrocarbon components, and of the organosulfur, nitrogenous, and oxygenous compounds entering into the composition of petroleum. (Author)

AD-257 300 Div. 10, 13
(9 June 61) OTS price $6.60

Rocketdyne, Canoga Park, Calif.
RESEARCH ON THE HAZARD CLASSIFICATION OF NEW LIQUID ROCKET PROPELLANTS,
Quarterly progress rept. for period ending 30 Apr 61. 30 Apr 61, 65p. incl. illus. tables.
(Rept. no. R-2452-5)
(Contract AF 33(616)6939)
Unclassified report

DESCRIPTORS: *Liquid rocket propellants, *Hazards, Handling, Storage, Pentaboranes, Nitrogen compounds, Tetroxides, Chlorine compounds, Fluorides, Hydrazines, Rocket oxidizers, Safety, Methyl hydrazines, Design, Tests, Toxicity, Blast, Pressure Ignition, Rocket fuels.

Quantitative results from 57 small-scale tests are presented to supplement preliminary results from visual observations. The spills of ClF3, N2O4, N2H4, and B5H9 were made singly and in pairs, on various surfaces under different ambient conditions. ClF3 reacted with all surfaces (except the concrete), causing either ignition or weak audible reports and a considerable release of toxic vapors. Spills of B5H9 on various surfaces, resulted in spontaneous ignition with air under some of the conditions tested. On all surfaces except H2O the propellant ignited above ambient temperatures of 70 F; on dirt, and asphalt surfaces, the propellant ignited below this temperature. Spills of N2O4 with ClF3 failed to show any indication of reactions. N2H4 ignited instantaneously with ClF3 under all test conditions. Some of the tests resulted in a series of very slight overpressures which were compared to equivalent overpressures originating from smaller amounts of TNT. Spills of B5H9 and ClF3 resulted in hypergolic ignition and intense fireballs. Results from spills of N2H4 and N2O4 were very similar to those of the Titan II propellants. (Author)

AD-257 349 Div. 10, 14, 32
(9 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
WOOD FUEL COMBUSTION PRACTICE,
by L. H. Reineke. May 61, 9p. incl. tables.
(Rept. no. 1666-18)
Unclassified report

DESCRIPTORS: *Wood, *Fuels, *Combustion, Charcoal, Chemical reactions, Water, Evaporation, Vaporization, Heaters, *Economics.

Improvements in wood burning equipment and methods have resulted from better fundamental knowledge of how wood burns, together with demands for better, more uniform heating with greater convenience and lower costs of operation. Mechanical feeds and automatic controls have been applied to wood-burning furnaces, and special domestic burners for sawdust and hogged fuels have been developed. Suspension burning of dry wood has been applied in industrial furnaces. A special type of furnace has been developed for burning very wet wood and bark, and high-efficiency magazine-type heaters of the slow-combustion type are being used. Fireplaces and charcoal grills have been redesigned for greater efficiency. Three distinct phases in the burning of wood may take place in sequence or simultaneously: (1) the removal of free water by evaporation below the boiling point and vaporization above the boiling point; (2) the chemical breakdown of wood into charcoal, gas, and volatile liquids occurs; and (3) the charcoal is burned forming CO2.

11. GROUND TRANSPORTATION EQUIPMENT

AD-256 968 Div. 11
(5 June 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF OUTFIT, GASOLINE, TRANSFER, FUEL 525-GALLON CAPACITY.
5 May 61, 7p. (Proj. NR ATB 2-131)
Unclassified report

DESCRIPTORS: Gasoline, *Fuel tanks, *Fuel pumps, Arctic regions, Tests, Transportation, Terrain, Refueling pumps.

Check tests were made to determine the suitability of the Outfit, Gasoline, Transfer, Fuel, 525-Gallon Capacity, for Army use under arctic conditions. It was concluded that: (a) The item tested is suitable as an interim item for Army use under arctic conditions; (b) It should be modified, if practicable, to correct the shortcomings listed in Annex B; (c) Development should be continued to provide a Conversion Kit, Bulk Petroleum Refueler which fully meets the approved military characteristics; and (d) The maintenance package should include instructions for installation and operation of the Outfit, Gasoline, Transfer, Fuel, 525-Gallon Capacity with the Carrier, Personnel, Armored, Full Tracked, M113. (Author)

12. GUIDED MISSILES

AD-256 947 Div. 12
(5 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF A LOAD-ALLEVIATING STRUCTURE ON THE LANDING BEHAVIOR OF A REENTRY-CAPSULE MODEL,
by Edward L. Hoffman, Sandy M. Stubbs, and John R. McGehee. May 61, 29p. incl. illus. (Technical note D-811)
Unclassified report

Also available from NASA, Wash, 25, D. C. as NASA Technical note D-811.

DESCRIPTORS: *Space capsules, Impact shock, *Re-entry vehicles, Landing, Parachutes, Landing impact, Load distribution, Tests, Attenuation, Concrete, Sand, Glass textiles, *Re-entry aerodynamics, Water, Model tests, Aluminum alloys, Parachute descents, Design, Acceleration.

Model tests were made to determine the landing-impact characteristics of a parachute-supported reentry capsule that had a compliable metal structure as a load-alleviating device. A 1/6-scale dynamic model having compliable Al-alloy legs designed to give a low onset rate of acceleration on impact was tested. Landings were made on concrete, sand, and water. The maximum acceleration encountered was approximately 35g and the maximum onset rate was 2,000 g/sec. The model tumbled in landings on concrete at the 55 degrees flight-path, + or - 30 degrees contact-attitude conditions; therefore, load-alleviating devices on the canister end of the model would be required. To evaluate the scaling characteristics of compliable metal structures, models were tested with 1/4.1-scale and full-scale Al-alloy legs. The maximum vertical accelerations and strokes obtained from tests of the 1/4.1-scale and full-scale legs were the same within the recording accuracy of the equipment. (Author)

AD-256 971 Div. 12, 9
(5 June 61) OTS price $5.60

Army Ordnance Missile Command, Redstone Arsenal, Huntsville, Ala.
MISSILE A. PERFORMANCE TESTS OF MISSILE A DELTA VARIABLE AREA FINS,
by M. H. Staggs. 7 Sep 60, 1v. incl. illus. table.
(Proj. TU1-2083)
(ARGMA TN1E162-7) Unclassified report

DESCRIPTORS: *Rocket propelled sleds, Tests, Aerodynamics, *Triangular wings, *Variable sweep wings, Stability, Simulation, *Tracks (Aerodynamics), *Guided missiles.

Thirteen sled firings simulating dynamic firing conditions were conducted on a horizontal ballistic track to determine the performance of the delta variable area fins for Missile A. Results of these firings are presented. (Author)

AD-257 062 Div. 12, 21, 27
(5 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
RESIDUAL-LOAD-PLUS-POWERPLANT WEIGHTS FOR ORBIT-AL-LAUNCH NUCLEAR ROCKETS,
by Paul G. Johnson, James W. Miser, and Roger L. Smith. May 61, 26p. incl. illus. tables (Rept. no. TN-D-843)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical Note D-843.

DESCRIPTORS: Design, *Nuclear propulsion, *Satellite vehicles, *Booster rockets, Thrust, Specific impulse, Rocket motors.

Charts are presented of residual-load-plus-power-plant weight as a function of thrust, specific impulse, initial weight in orbit, and mission energy for orbital-launch nuclear rockets. The initial weights range from 7600 to 226,000 pounds (corresponding to Atlas-Centaur, Saturn, and Nova boost vehicles), and missions are selected to cover the approximate capability inherent in the specified weights. Thrust is varied so that ratio of thrust to initial weight lies between 0.01 and 1.0, while specific impulse is varied from 450 to 1000 pounds per pound per second. Values of residual-load-plus-powerplant weight are computed by estimating the required weights of hydrogen propellant, tank, and vehicle structure. (Author)

AD-257 162 Div. 12, 22
(2 June 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ROCKET WEAPONS,
by Emil Klesl. 5 Jan 61. 46p. incl. tables. (Trans. no. MCL-696 from Raketove Zbrane:pp. 27-35, 175-212, 1960)
Unclassified report

DESCRIPTORS: *Technological intelligence, USSR, Rhenium, Cobalt, Plastics, *Rockets, *Sounding rockets, *Guided missiles, Surface to surface, *Rocket launchers, *Anti-aircraft ammunition, *Satellite vehicles, Rocket models, Air to air, Submarines, Surface to air, Cruisers, Armament, War potential.

Rocket weapon research in the Soviet Union is discussed. Accomplishments are presented in the area of meteorological and geophysical high-altitude rockets. Several types of rocket weapons are reviewed, which were displayed during the Moscow parade staged on November 7, 1957. The development of intercontinental ballistic missiles is also discussed. Tactical and technical data on these missiles is tabulated.

AD-257 283 Div. 12
(9 June 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
STUDY OF A SOLAR SENSOR FOR USE IN SPACE-VEHICLE ORIENTATION CONTROL SYSTEMS,
by Paul R. Spencer. June 61, 39p. incl. illus. tables (Technical Note D-885)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-885.

DESCRIPTORS: Electronic equipment, *Satellite vehicles, Design, Control systems, Tests, Solar cells, *Spaceships, Errors, Stabilization, Sensitivity, Space environmental conditions, *Solar spectrum, Solar energy, *Detectors, Photosensitivity, Silicon, Radiation damage.

A solar sensor is proposed to meet the existing need for orienting space vehicles toward the sun. Consideration has been given to such requirements as reliability, capture capability, sensitivity, and power consumption. The effects of varying certain design parameters are shown and improvements are suggested. The effects of a space environment are discussed. Results obtained from an experimental model of a solar sensor are presented. (Author)

AD-257 302 Div. 12, 6, 25
(9 June 61) OTS price $3.60

Motorola, Inc., Riverside, Calif.
PULSED LIGHT INVESTIGATION,
by Melvin H. Horman. Interim engineering rept. no. 2, Mar-May 61. June 61. 32p. incl. illus. tables (Rept. no. RLI-3854-2)
(Contract AF 33(616)7680)

Unclassified report

DESCRIPTORS: *Light pulses, Light, Sources, Illumination, Airborne, *Photoelectric target seekers, *Optical tracking, Light transmission, *Guided missiles, *Guidance, Sparks, Test equipment, Capacitors, Measurement, Blackbody radiation, Mineral oils, Air, Brightness.

Investigation was continued on a pulsed light source of energy for use in an active target seeker for missile guidance. The results are presented of spark brightness measurements made in air and mineral oil at very low energy levels. Representative curves showing brightness as a function of time show that the pulse duration increases with the discharge energy in the oil case. The data obtained from several different connections of the multiple configuration source confirm the preference of both inner and outer conducting paths in conjunction with an extended foil capacitor stack. Several facets affecting the spark characteristics are discussed. (Author)

AD-257 304 Div. 12, 25
(9 June 61) OTS price $1.60

Jansky and Bailey, Inc., Washington, D. C.
ELECTROMAGNETIC COUPLING DUE TO APERTURES IN MISSILE BODIES,
by Clifton Merchant. 30 May 61, 12p. incl. illus. (Technical rept. no. 5455)
(Contract N178-7604)

Unclassified report

DESCRIPTORS: *Guided missiles, Cylindrical bodies, *Electromagnetic fields, Electric fields, Magnetic fields, Surfaces, Theory, Electrical conductance, Hazards, *Guided missile warheads, Diffraction, Polarization, Electric igniters, Electromagnetic waves, Mathematical analysis.

The problem of electromagnetic coupling between the interior and exterior of cylindrical missile bodies due to apertures in the missile body was studied. Expressions were derived which can be used to determine the electromagnetic field at any point (interior and exterior) in terms of a field incident to the missile. (Author)

AD-257 598 Div. 12, 15
(14 June 61) OTS price $5.60

Aerospace Corp., Los Angeles, Calif.
SURVEY OF CURRENT LITERATURE ON SATELLITE LIFETIMES,
by B. Billik. 11 Apr 61, 49p. incl. illus. table, 27 refs. (Rept. no. TDR-594(1560-01)TN-1)
(Contract AF 04(647)594)

Unclassified report

DESCRIPTORS: *Satellites, *Equations, Ballistics, *Orbital flight paths, *Satellite attitude, Satellite vehicle trajectories, Astrophysics, Astronautics, Motion, *Differential equations, Atmospherics, Differential geometry, Velocity.

The equations appearing in the open literature pertaining to the lifetime of a satellite in orbit about the earth are compared both quantitatively and qualitatively to determine the areas and extent of agreement. For orbits which are initially circular, it is found that all of the equations reviewed give results which are well within the inherent uncertainties in the physical situation itself. Hence, any one of the equations presented may be employed for adequate lifetime calculations. When the ballistic parameter of the satellite is not excessively small, elliptical orbits of eccentricity greater than 0.1 are shown to decay in such a manner that the perigee altitude remains very nearly constant. For eccentricities approaching zero, however, the perigee altitude is found to vary logarithmically with the eccentricity. In this case, the orbit approaches circularity asymptotically. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-257 168 Div. 13, 1
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BULLETIN OF TECHNICAL AND ECONOMIC INFORMATION (SELECTED ARTICLES).
1 Feb 61, 14p. incl. illus. (Trans. no. MCL-814 from Byulleten' Tekhniko-Ekonomicheskoy Informatsii 8:pp. 40-42, 78-82, 1960).

Unclassified report

DESCRIPTORS: *Hoists, Germany, Poland, Technological intelligence, Vehicles.

The following articles are presented: (1) The self lifting crawler cranes, model PKT, by K. I. Yemelin, and (2) Automobile cranes for assembling and dismantling operations in East Germany and Poland, by M. D. Gilula.

AD-257 572 Div. 13, 22
(14 June 61) OTS price $11.50

Illinois U., Urbana.
RESPONSE OF ARCHES UNDER DYNAMIC LOADS,
by R. T. Eppink and A. S. Veletsos. Aug 60, 148p. incl. illus. tables.
(Contracts AF 29(601)2591 and AF 29(601)464, Proj. 1080)
(AFSWC TR 60-53) Unclassified report

DESCRIPTORS: Structures, Algebra, Stresses, Mathematical analysis, Mechanics, Digital computers, Elasticity, Deformation, Design, Programming, Transients, Blast, *Explosion damage, Load distribution, Numerical methods and procedures, Integral equations, *Bombs.

A study was made of the response of arches subjected to the influence of transient forces. A numerical procedure is presented for the computation of the dynamic response of arches for both the elastic and the inelastic ranges of deformation. The procedure is applicable to arches having any shape and any distribution of mass and stiffness. The distribution of the pressure along the arch and its timewise variation may be arbitrary. Computer programs are described for the analysis of two general classes of problems: (a) circular elastic arches subjected to a uniform normal pressure of arbitrary timewise variation; and (b) arches of arbitrary shape subjected to a triangular moving pressure pulse. For the latter case it is possible to evaluate the response in the inelastic range of behavior. Numerical solutions are presented for a wide range of the parameters involved, and the effects of the various parameters are discussed. (Author)

14. MATERIALS (NON-METALLIC)

AD-256 900 Div. 14, 12, 25
(2 June 61) OTS price $8.10

Dielectrics Lab., Johns Hopkins U., Baltimore, Md.
DIELECTRICS FOR SATELLITES AND SPACE VEHICLES,
by Louis J. Frisco. Interim rept. no. 2, 1 May 60-28 Feb 61. 15 Mar 61, 79p. incl. illus. tables, 17 refs.
(Contract DA 36-039-sc-78321, Proj. 3A-99-15-001)
Unclassified report

DESCRIPTORS: *Dielectrics, Upper atmosphere, *Space environmental conditions, Electrical properties, Insulating materials, *Electric insulation, Dielectric properties, X-rays, Ultraviolet radiation, Conductivity, Tests, Materials, *Satellite vehicles, *Spaceships, Glass Textiles, Ceramic materials, Resins, Laminates, Plastics.

Results of the second phase of a study of the effects of simulated high altitude environment on the electrical properties of insulating materials are reported. High vacuum breakdown and flashover measurements in the 10 to the -6th power mmHg range at d-c, 60-cps, 2-mc and 18-mc indicate that electrode surface roughness is the controlling factor. Dielectric properties of the specimen material do not influence flashover voltage. X-ray and ultraviolet radiation have no effect on flashover voltage. Significant changes in low-frequency loss properties and d-c conductivity were observed during and after vacuum irradiation with 50-KV x-rays. Ultraviolet radiation produced no immediate effects on loss properties. (Author)

AD-256 930 Div. 14, 32
(2 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
VAPOR DRYING,
by J. M. McMillen. Rept. on Special Methods of Seasoning Wood. Rev. Mar 61, 3p. (Rept. no. 1665-3 (Rev.))
Unclassified report

DESCRIPTORS: *Wood, Drying ovens, Vapors, *Dehydration, Water vapor, Heating.

AD-256 931 Div. 14, 32
(2 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
HIGH-FREQUENCY DIELECTRIC HEATING,
by J. M. McMillen and W. L. James. Rept. on Special Methods of Seasoning Wood. Rev. Feb 61, 4p. (Rept. no. 1665-7 (Rev.))
Unclassified report

DESCRIPTORS: *Induction heating, Drying ovens, Dielectrics, *Dehydration, Heating, *Wood.

AD-256 933 Div. 14
(2 June 61) OTS price $1.60

Forest Products Lab., Madison, Wis.
MANUFACTURE AND GENERAL CHARACTERISTICS OF FLAT PLYWOOD.
1925 Rev. Apr 61, 15p. (Rept. no. 543)
Unclassified report

DESCRIPTORS: *Plywood, Laminates, Bonding, Wood, Moisture, Mechanical properties, Adhesives, Resins, Manufacturing methods, Processing, Storage.

Plywood is manufactured by bonding thin sheets of wood (veneers) together with adhesives in such a way that the mechanical and physical properties of the wood are redistributed. This manufacture of plywood requires special equipment, knowledge, and technique. Important steps in the process of making plywood are outlined, as well as information on types and grades and some properties of plywood. The information is based upon observations of factory practice and upon extensive experiments at the Forest Products Laboratory. (Author)

Division 14 - MATERIALS (NON-METALLIC)

AD-256 934 Div. 14
(2 June 61) OTS price $3.60

Forest Products Lab., Madison, Wis.
PULPING AND PAPERMAKING EXPERIMENTS ON CERTAIN PHILIPPINE WOODS AND PLANT FIBERS.
Mar 61, 21p. tables (Rept. no. 2207)
Unclassified report

DESCRIPTORS: Philippine Islands, Plants, Wood, *Wood pulp, *Wood pulp fibers, *Paper, Abaca fibers, Sulfate pulp, Processing, Wood pulp machines.

Investigations were made to determine the suitability of five Philippine hardwoods for use in several kinds of paper, including wrapping paper, corrugated container board, and newsprint paper. The particular hardwoods investigated were ilang-ilang (Canangium odoratum), manggasinoro (Shorea philippinensis), red lauan (Shorea negrosensis), tangile (Shorea polysperma), and white lauan (Pentacme contorta). Supplementary fibrous materials investigated as possible sources of long fiber included abaca or Manila hemp (Musa textilis), kenaf (Hibiscus cannabinis), and the softwood, benguet pine (Pinus insularis). The Philippine hardwoods, the plant materials, and the benguet pine all were readily pulped by the sulfate process. The hardwoods did not respond favorably to pulping by the neutral sulfite process. The tendency for the pulps and certain papers or boards to be deficient in tearing and folding strength due to the short fibers used can be practically offset by the addition of moderate quantities of pulps made from the long-fibered materials. Thus, the hardwoods were indicated to be suitable as the basic fiber source for a pulp and paper establishment for production of a variety of products. (Author)

AD-256 938 Div. 14, 8
(5 June 61) OTS price $1.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION FOR THE DEVELOPMENT OF CERAMIC BODIES FOR ELECTRON TUBES,
by H. R. Wisely. 8 May 61, 9p. (Scientific rept. no. 2)
(Contract AF 19(604)7410)
(AFCRL-344) Unclassified report

DESCRIPTORS: *Electron tubes, Reliability, *Ceramic materials, *Thermal expansion, Materials, Silicates, Alkaline earth compounds, Quartz crystals, Aluminum compounds, Oxides.

A continuing search of the literature on thermal expansion data of ceramic materials has so far uncovered several compositional areas that appear worthy of experimental exploration as possible sources of high thermal expansion materials. These include microcrystalline quartz, gamma-alumina and alkaline-earth silicates. (Author)

AD-256 954 Div. 14, 20, 25, 26
(5 June 61) OTS price $8.10

Radiation Effects Information Center, Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON STRUCTURAL ADHESIVES,
by N. J. Broadway and S. Palinchak. 1 Mar 61, 1v. incl. illus. tables (REIC rept. no. 17)
(Contract AF 33(616)7375, Proj. 4458; continuation of Contract AF 33(616)6564)
Unclassified report

DESCRIPTORS: *Radioactivity, *Adhesives, *Radiation damage, Aluminum, Mechanical properties, Bonding, Structures, Stresses.

The effects of radiation on adhesives were studied on aluminum strips bonded with the structural adhesive to give lap-test specimens. The specimens were irradiated in air at ambient temperatures with no stress applied. Tensile-shear and similar tests were then run on the irradiated and nonirradiated samples. The present information summarizes the radiation stability of adhesives and suggests the areas in which further work is required. The radiation stabilities of various types of adhesives which have been reported are compared, showing the maximum doses at which they may be expected to give satisfactory service. Tensile-shear data are used primarily for these comparisons because this information has been obtained for the greatest number of adhesives. Bend-test data are also used as a means of comparison where such data are available. The adhesives are discussed according to chemical type in their approximate order of radiation stability. (Author)

AD-257 025 Div. 14
(6 June 61) OTS price $4.60

Convair, Fort Worth, Tex.
THE EFFECTS OF REACTOR RADIATION OF ELASTOMERS AND SEALANTS. IV.
by L. L. Morgan. 9 May 61, 46p. incl. tables.
(Document no. NARF-61-6T; Rept. no. MR-N-174-4)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: *Elastomers, *Synthetic rubber, Nitrile rubber, Rubber, Urethanes, Polymers, Cyanates, Polymerization, Synthesis, Radiation damage, Gamma rays, Temperature, Mechanical properties, Tensile properties, Neutron bombardment, Tests, Seals.

Polyurethane elastomers are produced through the reaction of certain diisocyanates and polyhydroxy compounds (polyesters and polyethers). Thirteen polyurethane elastomers from 3 manufacturers were irradiated to various doses at several temperatures. The highest dose was 7 x 10 to the 10th power ergs/gm(C) gamma plus accompanying neutrons. The irradiation temperatures ranged from -45 F to 260 F. Following irradiation, stress-strain measurements were made on all of the materials. Compression-set tests were performed on certain selected elastomers. The data tend to indicate that materials from any particular manufacturer were sufficiently similar so that their percentage change from control values were of the same order of magnitude under the same conditions. (Author)

AD-257 034 Div. 14, 25
(8 June 61) OTS price $1.60

Systems Research Labs., Inc., Dayton, Ohio.
THE ELECTRICAL BEHAVIOR OF REFRACTORY OXIDES,
by Robert M. Vest. Bimonthly progress rept. no. 2, 12 May 61, 7p. illus. (Rept. no. 203-2)
(Contract AF 33(616)7748)
Unclassified report

DESCRIPTORS: *Refractory materials, *Zirconium compounds, *Dioxides, Oxides, *Electrical properties, Crystals, Single crystals, Chlorides, Vacuum furnaces, Optical systems, Electrical conductance, Dielectric properties, Polarization, Thermoelectricity, Preparation, Growth.

POLYCRYSTALLINE SAMPLE PREPARATION: Dense, well sintered ZrO2 disks were prepared by cold pressing and firing in vacuum to 2000 C or higher. With increase in temperature, an increase in the degree of oxygen deficiency was indicated by change in color from white through grey to black. The level of O deficiency is to be established by the weight gain after complete reoxidation. Reoxidation experiments indicated that samples fired in vacuum at different soaking times do not exhibit the same behavior during reoxidation. PREPARATION OF SINGLE CRYSTAL ZIRCONIA: An apparatus was constructed which provides for visual observation of the seed during growth by means of a projection system and a light path through the center of a tube furnace modified to have a 1/4-in. gap in the winding at the center. An oxidation-reduction reaction is to be conducted between ZrCl4 and O. The optical system consists of a converted slide projector, quartz rods with polished rods for light pipes, and several lenses; the beam from the light source illuminates the seed from below, an enlarged shadow image of the seed being projected on a screen.

AD-257 063 Div. 14, 17
(5 June 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
STABILITY OF REFRACTORY COMPOUNDS IN HYDROGEN BETWEEN 4500 AND 5000 F, AND THEIR COMPATIBILITY WITH TUNGSTEN,
by Charles E. May and Paul D. Hoekstra. May 61, 12p. incl. illus. tables (Rept. no. TN-D-844)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-844.

DESCRIPTORS: *Refractory materials, *Carbides, *Nitrides, *Borides, Oxides, Dioxides, Hafnium compounds, Tantalum compounds, Titanium compounds, Zirconium compounds, Tungsten compounds, Tungsten, Hydrogen, Stability, High temperature research, Containers, Molybdenum compounds, Niobium compounds, Powder metals, Powder alloys, Decomposition.

The present work is a continuation of work described in NASA Memorandum 3-5-59E (AD-213 048). Each refractory compound was placed in a W cup which was inductively heated in a H atmosphere to temperatures between 4500 and 5000 F. Changes in pressure, weight, and crystal structure were taken as indications of reaction. HfC, TaC, TiC, ZrC, HfN, TiN, ZrN, and ZrO2 showed weight loss due to volatilization, decomposition, or reaction with H; reaction of TaN was indicated from diffraction data. Any reaction occurring for TaB2, WB, and NbC was less than the minimum detectable amount. Most of the compounds (except the nitrides) were found to be incompatible with the W container. This prevented the determination of the degree of stability of some of the materials in H. These results are compared with the earlier work at Lewis Research Center on the stability of these materials in H between 4000 and 4500 F. (Author)

AD-257 091 Div. 14
(6 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
EFFECTS OF AGING ON THE COMPRESSIVE PROPERTIES OF GLASS-FABRIC-BASE POLYESTER LAMINATES,
by Kenneth E. Kimball. May 61, 3p. table (Rept. no. 1882)
(Contracts AF 33(616)58-1 and AF 33(616)61-06; In cooperation with Wisconsin U.)
Unclassified report

DESCRIPTORS: *Glass textiles, *Resins, *Laminates, Plastics, Storage, Aging, Mechanical properties, Elasticity, Polymers, Esters.

Information was obtained on the effect of storage for 9 years in a normal atmosphere on the compressive properties of glass-fabric-base plastic laminates made with a typical polyester resin. In thickness and specific gravity, the specimens were comparable. Compressive stiffness and maximum strength had not changed by an appreciable amount after 9 years in storage. Proportional limit strength was lower after aging, but this may not be significant. In general, it can be concluded that storage for 9 years under normal conditions did not produce any significant changes in the compressive properties of typical glass-fabric-base polyester resin laminates. (Author)

AD-257 101 Div. 14
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EPOXY LACQUERS RESINS (Epoksidnyye Lakovyye Smoly)
by M. F. Sorokin. Jan 61, 22p. incl. tables, 56 refs. (Trans. no. F-TS-9851 from Khimicheskaya Promyshlennost' 5:54-61, July-Aug 57)
Unclassified report

DESCRIPTORS: *Epoxides, *Epoxy resins, Varnishes.

A review of the state of the art.

AD-257 228 Div. 14
(13 June 61) OTS price $4.60

Aberdeen Proving Ground, Md.
TX-200 TRANSMISSION OIL COMPATIBILITY PROGRAM,
by R. C. Kleinfeld. June 61, 1v. incl. illus. tables (Rept. no. DPS-235)
Unclassified report

DESCRIPTORS: Transmission, Fluids, *Oils, Transmission gears, *Automatic transmissions, Lubrication, Specifications, Tests, Test methods, Effectiveness, Plastic seals, Failure (Mechanics), Acrylic resins, Clutches, Gaskets, Lubricants.

A procedure was developed for laboratory compatibility tests with the TX-200 transmission. Using this procedure a referee base-line condition was established for the TX-200-2X transmission with MIL-L-2104A, OE-10, M14500, REO-148-61 oil. The objectives of the tests were to evaluate MIL-O-10295, OE-S arctic engine oil and

MIL-L-2104A, OE-30 engine oil as automatic transmission fluids and to compare the results of the laboratory tests with actual cross-country test-course operation. These tests showed that with reference to the established base line, MIL-O-10295, OE-S. REO-127 oil is incompatible. However, the laboratory test cycle is less severe on clutch wear and more severe on low-range gearing than the 5000-mile cross-country test. Thus it is recommended that a 5000-mile cross-country test be run in a cold climate with arctic engine oil as the transmission fluid to determine whether or not low-sun-gear failures could occur during actual field operation. The MIL-L-2104A, OE-30, M14804 oil was compatible with the transmission except for breakdown of the polyacrylate piston seals. Bench-type investigations should be conducted to determine the cause of seal failure. (Author)

AD-257 241 Div. 14, 17
(16 June 61) OTS price $1.60

Aberdeen Proving Ground, Md.
TEST OF ALUMINUM SNATCH-BLOCK SHEAVES (10-INCH WITH SPECIAL HARD COAT,
by L. S. Weaver. June 61, 5p. (Rept. no. DPS-256)
Unclassified report

DESCRIPTORS: Pulleys, Aluminum alloy, *Resistance, *Cable assemblies, *Abrasive coatings, *Coatings, Tests.

Two 10-inch snatch-block sheaves made of 7075 (75S), T6 aluminum alloy, with a special hard coating for good wear- and abrasion-resistance qualities to the cable groove were tested. Although the hard coat chipped off easily, there was no gouging or deformation of the base material in the sheave groove on overloading to 20 tons. The suitability and durability of aluminum sheaves without special coatings should be evaluated to see if they would be satisfactory for use in the field. (Author)

AD-257 339 Div. 14, 26
(9 June 61) OTS price $8.10

Stratos Div., Fairchild Engine and Airplane Corp., Bay Shore, N. Y.
THE DEVELOPMENT OF LUBRICANTS FOR HIGH-SPEED ROLLING CONTACT BEARINGS OPERATING OVER THE RANGE OF ROOM TEMPERATURE TO 1200 DEGREES F,
by D. S. Wilson, S. Gray and others. Summary rept. no. 2, 1 Jan-31 Dec 60. Jan 61, 81p. incl. illus. tables, 8 refs. (In cooperation with Battelle Memorial Inst., Columbus, Ohio, and Tribo-Netics Labs., Vermilion, Ohio)
(Contract AF 33(616)6589)
(WADD TR 60-732) Unclassified report

DESCRIPTORS: *Lubricants, *Bearings, *Ball bearings, Materials, Cobalt alloys, Carbides, Titanium compounds, Molybdenum compounds, Cadium compounds, Graphite, Phthalocyanines, Temperature, Sulfides.

A series of powdered and gaseous type lubricant rolling and sliding characteristic studies are described. Lubricant materials evolved from these studies were evaluated in 20 mm angular contact bearings of titanium carbide cermets and cobalt-base alloys over the range from room temperature to 1200 F. The three most successful gaseous entrained lubricants--molybdenum disulfide in a nitrogen environment, graphite plus cadmium oxide mixture in an air environment, and molybdenum disulfide plus metal-free phthalocyanine mixture in a nitrogen atmosphere--have shown promise in ball bearings operating at speeds to 30,000 rpm and thrust loads of 100 lb over the range from room temperature to 1200 F for periods to 10 hr.

AD-257 350 Div. 14
(9 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
BOARD MATERIALS FROM WOOD RESIDUES,
by Wayne C. Lewis. May 61, 6p. incl. table, (Rept. no. 1666-21 (Rev.))
Unclassified report

DESCRIPTORS: *Fiberboard, *Wood, Wood pulp, Wood pulp fibers, Binders, Resins, Insulating materials, Thermal insulation, Manufacturing methods, Asphalt, Phenolic resin, Urea formaldehyde resins, Industrial production, Industrial equipment.

Contents:
Manufacturing processes
Effects of kind and form of raw material
Economics of plant size
Primary manufacture of fiber or particles
Resin requirements
Pressing, drying, and curing equipment
Treatment after manufacture

AD-257 351 Div. 14
(9 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
VENEER CUTTING AND DRYING PROPERTIES,
May 61, 7p. incl. tables, 14 refs. (Rept. no. 1766-16)
Unclassified report

DESCRIPTORS: *Wood, Processing, Manufacturing methods, Woodpulp, Telephone poles, Trees, *Plywood, Drying ovens, Cutting tools, Containers, Lathes.

Contents:
Tamarack
Description of logs tested
Veneer cutting
  Rotary cutting
  Slicing
Veneer drying
Veneer yields and grades
  Rotary-cut veneer
  Sliced veneer
Stain
Gluing
Finishing
Appearance and potential use of veneer

AD-257 353 Div. 14
(9 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
FOREST PRODUCTS LABORATORY NATURAL FINISH,
May 61, 4p. incl. table, (Rept. no. 2096 (Rev.))
Unclassified report

DESCRIPTORS: *Wood, *Finishes, Colors, Oils, Zinc compounds, Stearates, Turpentine, Waxes, Organic solvents, Mineral oils, Organic materials, Weatherproofing, Preservation, Organic coatings.

The report describes a practical and durable natural finish that is classified as a modified semitransparent oil-base stain that effectively retains much of the natural beauty of wood siding exposed to the weather. Test results indicate that one application of the finish on planed surfaces of bevel siding of redwood and western redcedar fully exposed to the weather should last 3 years before needing renewal. On protected areas, the finish has lasted a year or two longer. The finish should last longer on siding that receives some shelter from trees, neighboring houses, or wide roof overhang than on siding fully exposed to the weather. The finish can be made in a variety of red and brown colors. Three colors that are well suited for use on siding are cedar, dark redwood, and light redwood. (Author)

AD-257 354 Div. 14
(9 June 61) OTS price $1.10

Forest Products Lab., Madison, Wis.
SPECIAL METHODS OF SEASONING WOOD.
Apr 61, 2p. 11 refs. (Rept. no. R1665-2)
Unclassified report

DESCRIPTORS: *Wood, Processing, Aging, *Dehydration, Solvent extraction, Water, Steam, Organic solvents, Heat, Acetones, Ethylenes, Chlorides.

The solvent seasoning method for lumber which was developed by the Western Pine Association Research Laboratory is described. The process involves treating the wet wood with a hot solvent, acetone, maintained above the boiling temperature of water to extract the desired amount of water. The residual solvent is then boiled off and recovered along with wood extractives. Wood can be dried by this method more rapidly than by ordinary methods such as kiln drying. The process apparently does not reduce the strength of the wood. The practicability of this method of drying wood will depend upon the value of the extractives as well as the savings resulting from shorter drying time and improvement of the lumber. The McDonald process or azeotropic drying uses a commercial dry-cleaning solvent, perchloroethylene, which is not miscible with water.

AD-257 388 Div. 14, 25
(12 June 61) OTS price $1.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
FINE-GRAINED FERRITES. I. NICKEL FERRITE.
by W. W. Malinofsky and R. W. Babbit. 9 Mar 61, 15p. incl. illus. table (ASRDL Technical rept. no. 2187)
Unclassified report

DESCRIPTORS: *Ferrites, *Nickel compounds, Processing, Magnetic properties, Crystal structure, Flame spraying, Heat, Pressure, Time, Temperature, Density, Oxides, Microstructure, Resonance, X-ray diffraction analysis, X-band, Iron compounds, Preparation, Production.

A process was developed for preparing dense nickel ferrite bodies composed of grains small enough to remain single domain, and their magnetic and crystallographic properties were determined This process was accomplished by combining two techniques, flame-spraying and hot-pressing, and investigating the effect of varying the parameters in each of these. Powder as fine as 0.02 micron was prepared of single-phase nickel ferrite, and was subsequently densified by hot-pressing while maintaining the crystallite size as small as 0.06 micron (below the critical size for multi-domains). The effect on the dispersion of the complex permeability as the ferrite is annealed through the critcal size is shown. Of practical interest were an improvement in the temperature coefficient of initial permeability over conventionally prepared ferrite and good linearity in main resonance loss at high-power levels at X-band. X-ray diffraction determinations of crystalline phases and crystallite sizes are given, along with measurements of apparent density. Theoretical considerations indicate domain rotation to be the mechanism responsible for the resonances observed at high frequencies. (Author)

AD-257 537 Div. 14, 3, 13, 26
(13 June 61) OTS price $1.60

Institute of Paper Chemistry, Appleton, Wis.
DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL.
Monthly progress rept. no. 7, 29 Mar 61-28 Apr 61. 24 May 61, 17p. incl. tables.
(Contracts DA 18-108-405-cml-941 and DA 18-108-cml-6561, Proj. 2256) Unclassified report

DESCRIPTORS: *Fiberboard, Insulating materials, Shelters, Wood pulp, Charcoal, Additives, Chemical warfare agents, Aerosols, Gases, Diffusion, Penetration, Test methods.

Boards were made from 4 wood pulp samples to determine the relative effects of the individual pulps on the density and other board characteristics. Three sizing materials, Aquapel 486, Aquapel 360, and Cyron, were evaluated on a pulp blend; values for water absorption (2-hr immersion) as low as 5 to 6 vol-% were attained. Preliminary results of gas life evaluations indicate that excessive amounts of sizing are detrimental to the CK life. Overdrying drastically reduced the CK gas life. Gas life and DOP smoke penetration tests were made on diffusion board planed on both sides; some effect on gas life not proportional to thickness was indicated.

AD-257 555 Div. 14, 7, 25
(12 June 61) OTS price $6.60

Linden Labs., Inc., State College, Pa.
HIGH TEMPERATURE CERAMIC DIELECTRICS,
by W. R. Buessem and P. A. Marshall, Jr. Quarterly rept. no. 4, 15 Dec 60-15 Mar 61. 15 Apr 61, 58p. incl. tables, (Rept. no. 10)
(Contract DA 36-039-sc-78912)
Unclassified report

DESCRIPTORS: *Ceramic materials, *Dielectrics, High temperature research, *Barium compounds, *Titanates, *Tantalum compounds, Oxides, Ferroelectric materials, Refractory materials, Production, Fluorination, Electrical properties, *Ceramic capacitors, Resistance, Conductivity, Temperature, Phase studies, Deterioration, Mechanical properties, Processing, Ferroelectric crystals.

New experimental data on BaTiO3 bodies with Ta2O5 additions: series 33 without extra Ba and series 47 and 48 with extra Ba are presented. A new picture of the constitution of BaTiO3 bodies with additions of higher-valent cations is developed. There are 2 ferroelectric phases with completely different electrical properties which can form in these systems: One, which is called the alpha-phase, is highly conducting; it can be visualized as being a solid solution of BaTiO3 with a hypothetical compound, Ba2Ti3+Ta5+O6. The other ferroelectric phase, called beta-phase, can be visualized as a solid solution of BaTiO3 with the compound BaTa2O6. Results on continuous fluorination of BaTiO3 bodies in a tunnel kiln indicate that a 100% yield of good, stable bodies are possible with this production method. (Aurhor)

AD-257 562 Div. 14, 25, 26
(13 June 61) OTS price $2.60

Massachusetts U., Amherst.
ORIENTATION STUDIES ON DRAWN POLYOLEFINS,
by J. Powers, D. G. LeGrand and others.
22 May 61, 10p. incl. illus. 18 refs. (ONR technical rept. no. 32)
(Contract Nonr-335700, Proj. NR 356-378)
Unclassified report

DESCRIPTORS: *Polymers, *Ethylenes, *Films, *Propenes, Crystal structure, Heat treatment, Refraction, X-ray diffraction analysis, *Plastics, *Crystals, Determination, Plasticity, *Tensile properties, Deformation, Lattices.

X-ray diffraction and birefringence data obtained indicate that quenched samples possess more orientation at a given elongation for both polyethylene and polypropylene films. Thus, the finer the texture and the lower the degree of crystallinity, the less the stress required to orient the polymer a given amount. Polyethylene film follows a 3 orientation process on cold drawing with the a-axis orienting perpendicular to the stretching direction twice as rapidly as the b-axis, as the c-axis is turned toward the stretching direction. Polypropylene film, on the other hand, shows random orientation of the a- and b-axis about the c-axis as the c-axis is turned toward the stretching direction. This may be related to differing ease of crystal distortion between the two polymer systems. (Author)

15. MATHEMATICS

AD-256 902 Div. 15
(2 June 61) OTS price $3.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOME HIGHER ORDER INTEGRAL IDENTITIES WITH APPLICATION TO BOUNDING TECHNIQUES,
by J. H. Bramble and B. E. Hubbard. Apr 61, 32p. (Technical note no. BN-241)
(Contract AF 49(638)228; In cooperation with Naval Ordnance Lab., White Oak, Silver Spring, Md.)
(AFOSR-759) Unclassified report

DESCRIPTORS: Tensor analysis, *Integrals, Matrix algebra, Membranes, Operators (Mathematics), Differential equations, Difference equations, *Mathematics.

A certain class of integral identities is derived. These identities relate integrals of derivatives of a function u over the boundary C of a region R to integrals of derivatives of u over R. The highest order derivatives appear in the form of derivatives of a certain differential operator. An application of the identities to the problem of obtaining bounds for the derivatives of the solution of a certain boundary value problem is given. (Author)

AD-256 977 Div. 15
(5 June 61) OTS price $1.60

Columbia U., New York.
THE ASYMPTOTIC INDEPENDENCE OF THE SAMPLE QUANTILE AND THE SAMPLE EXTREME VALUE,
by Simeon M. Berman. 1961, 14p. (Technical rept. no. T-22; CU-14-58-ORD-1061)
(Contract DA 30-069-ORD-1061)
(OOR rept. no. 1716:16) Unclassified report

DESCRIPTORS: Statistical distributions, *Distribution theory, *Statistical analysis, Statistical functions, Probability, *Sampling.

The purpose of this paper is to prove under very general conditions that the sample quantile and the sample extreme value are asymptotically independent. This supplements the well-known facts that any two sample quantiles have a limiting bivariate normal distribution, and that the upper extreme and lower extreme are asymptotically independent (H. Cramer, Mathematical Methods of Statistics, 1946, pp. 367-378). (Author)

AD-256 984 Div. 15
(6 June 61) OTS price $11.00

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
POINTWISE BOUNDS IN PARABOLIC AND ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS,
by Fred J. Bellar, Jr. Doctoral thesis. May 61, 148p. 28 refs. (Technical note no. BN-246)
(Contract AF 49(638)228)
(AFOSR-760) Unclassified report

DESCRIPTORS: *Partial differential equations, *Mathematics, Integrals, Functions, Operators (Mathematics).

A method is presented for obtaining explicit upper and lower pointwise bounds for the solution of rather general interior boundary value problems. The differential equations associated with these problems are of the elliptic type in certain sections while both linear and non-linear parabolic equations are the subject of investigation in other sections. The bounds which are obtained are in terms of the integrals of the squares of known functions and hence, in the linear case, improvement is possible using the Rayleigh-Ritz technique. (Author)

AD-257 057 Div. 15
(7 June 61) OTS price $1.60

Rice Inst., Houston, Tex.
ON THE GEOMETRY OF FUNCTIONS HOLOMORPHIC IN THE UNIT CIRCLE, OF ARBITRARILY SLOW GROWTH, WHICH TEND TO INFINITY ON A SEQUENCE OF CURVES APPROACHING THE CIRCUMFERENCE.
by Gerald R. MacLane. Apr 61, 13p. (Technical note no. 4)
(Contract AF 49(638)205)
(AFOSR-589) Unclassified report

DESCRIPTORS: *Sequences, Functional analysis, Integral equations, Groups (Mathematics), Series, *Surfaces, Sheets, Number theory, Algebra, Functions, *Complex variables.

It is well known that there exist functions $H(\zeta)$, holomorphic in $|\zeta| < 1$, with $|H(\zeta)| \leqslant \mu(|\zeta|)$ where $\mu(r)$ is a given positive function which $\to \infty$ as $r \uparrow 1$, and such that $\min_{|\zeta| = r_n} |H(\zeta)|$ approaches ∞ as $n \to \infty$. Here $r_n \uparrow 1$ is an appropriately chosen sequence. Such functions may be constructed by the use of gap series or via an infinite product. The object of the present note is to construct such a function geometrically by starting with the Riemann surface $\mathcal{S}$ onto which $w = H(\zeta)$ maps $|\zeta| < 1$. The essence of the argument is in showing that $\mathcal{S}$ is hyperbolic and that $M(r) \leqslant \mu(r)$; these results are obtained via Caratheodory's theory of kernels. (Author)

AD-257 316 Div. 15, 12, 19
(9 June 61) OTS price $3.60

California U., Los Angeles.
THE THEORY OF TIME OPTIMAL PROCESSES IN LINEAR SYSTEMS,
by R. V. Gamkrelidze. Tr. by E. Stear, A. T. Maljuta and others. Jan 61, 33p. (Rept. no. 61-7; Trans. from Izvestia Akademii Nauk SSSR 2:449-474, 1958)
(Contract AF 49(638)20; In cooperation with Space Technology Labs., Inc., Los Angeles, Calif.)
(AFOSR 572) Unclassified report

DESCRIPTORS: *Linear systems, Theory, Control systems, Guided missile trajectories, Numerical analysis, Differential equations, Partial differential equations, Tensor analysis, Operators (Mathematics).

Contents:
The equations for optimal controls and optimal trajectories in the case of one control parameter
The synthesis of linear optimal systems with one control parameter
The case of several control parameters: The existence theorem

AD-257 318 Div. 15
(9 June 61) OTS price $4.60

California U., Los Angeles.
ON THE OPTIMUM SYNTHESIS OF RANDOM SAMPLING MULTIPOLE FILTERS WITH STATIONARY INPUTS,
by H. C. Hsieh, Feb 61, 39p. incl. illus. (Rept. no. 61-8)
(Contract AF 49(638)438, Proj. 9783)
(AFOSR-569) Unclassified report

DESCRIPTORS: *Sampling, Transformations (Mathematics), *Functions, Equations, Integral equations, Probability, *Polarizing filters.

The synthesis of a multipole filter whose inputs are stationary stochastic processes and are randomly sampled is considered. Each input will consist of signal and noise. The sampling process of each input is described by probability density functions of various orders and is assumed to be statistically independent from those of the others and also from the input processes. The system under investigation is linear and time invariant. The power spectral densities of inputs before sampling are assumed to be rational functions in s. In case the spectral densities after sampling are not rational functions in s, they have to be approximated by this type of function. Since the signals usually have power concentrated in low frequencies, appropriate approximants for these non-rational functions will introduce negligible error in designing. (Author)

AD-257 362 Div. 15
(12 June 61) OTS price $9.60

Institute of Statistics, North Carolina State Coll., Raleigh.
ESTIMATION OF THE SCALE PARAMETER IN THE WEIBULL DISTRIBUTION USING SAMPLES CENSORED BY TIME AND BY NUMBER OF FAILURES,
by Eugene H. Lehman, Jr. and R. L. Anderson. 1961, 104p. incl. illus. tables (Technical paper no. 1)
(Contract Nonr-48604, Proj. NR-042202)
Unclassified report

DESCRIPTORS: *Statistical distribution, Sampling, *Probability, Digital computers.

Contents:
Properties of the Weibull distribution
Maximum likelihood estimator of alpha
  Test procedure
  Derivation of the maximum likelihood estimator
  Mean and variance of the maximum likelihood Estimator of alpha
  Nonmonotonic behavior of V, A, D as P, N increase
  Asymptotic properties of the estimator
Cost and price of obtaining the maximum likelihood estimate of alpha
  Determination of E(d)
  Discussion of results
Computations
  Computer programs
  Demonstration of the program
Summary, conclusions, and recommendations for future research
List of references

AD-257 405 Div. 15
(12 June 61) OTS price $2.60

Cornell U., Ithaca, N. Y.
A SEQUENTIAL MULTIPLE-DECISION PROCEDURE FOR SELECTING THE BEST ONE OF SEVERAL NORMAL POPULATIONS WITH A COMMON UNKNOWN VARIANCE. II. MONTE CARLO SAMPLING RESULTS AND NEW COMPUTING FORMULAE,
by Robert E. Bechhofer and Saul Blumenthal. 1 May 61, 26p. incl. tables (Technical rept. no. 16)
(Contract AF 49(638)230)
(AFOSR-671) Unclassified report

DESCRIPTORS: Sequential analysis, *Sampling, Numerical methods and procedures, Digital computers.

Contents:
Statement of the statistical problem
Statistical assumptions
The experimenter's goal, specification, and requirement
Procedure D and the new computing formulae
Description of Procedure D
Definition of symbols
The sampling, stopping, and terminal decision rules
Computation of the stopping statistic
Use of Procedure D (method B) with various experimental designs
Simplified computing formulae
Numerical example
Monte Carlo sampling results with Procedure D
Description of the sampling procedure
Sampling results
Discussion of sampling results

AD-257 461 Div. 15
(12 June 61) OTS price $4.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A NUMBER OF RESULTS FROM STUDIES OF DIGITAL FILTERING AND THE CONVERGENCE OF ITERATIVE TECHNIQUES,
by Richard Crittendon, Ed Dubinsky, and others.
1 June 61. 46p. incl. illus. (Rept. no. 226-0061)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Polynomials, *Matrix algebra, Digital systems, Noise, Tracking, Series, Taylor's series, Sequences, *Numerical methods and procedures.

Results are collected from various studies that were motivated by the problems associated with estimating ballistic trajectories from tracking data. Material is given in the following areas: discrete orthonormal polynomials; digital filtering based on the eigenvector of the noise correlation matrix; digital filters for smoothing a linear time function from exponentially correlated noise; criteria guaranteeing convergence of Newton's method in one variable and a modified Newton's method in several variables; and a new and unique, but apparently inapplicable, approach to the smoothing of tracking data. (Author)

AD-257 479 Div. 15
(12 June 61) OTS price $1.60

Purdue U. School of Industrial Engineering and Management, Lafayette, Ind.
CHOOSING AN INVESTMENT PROGRAM AMONG INTERDEPENDENT PROJECTS,
by Stanley Reiter. May 61. 10p. incl. illus.
(Institute paper no. 13)
(Contract Nonr-110016, Proj. NR 047-026)
Unclassified report

DESCRIPTORS: *Management engineering, Economics, *Mathematical analysis, *Matrix algebra, Probability.

An analytical technique is presented for solving an investment decision problem involving interdependent projects.

AD-257 480 Div. 15
(12 June 61) OTS price $1.60

Parke Mathematical Labs., Inc., Carlisle, Mass.
TWO PAPERS ON THE THEORY OF BOOLEAN FORMULAS: MINIMAL INCLUDING SUMS, I AND II,
by E. W. Samson and L. Calabi. Mar 61, 1v.
(Scientific rept. no. 10)
(Contract AF 19(604)3471; In cooperation with Electronic Material Sciences Lab., Air Force Research Labs., Bedford, Mass.)
(AFCRL-128) Unclassified report

DESCRIPTORS: *Algebras, Operators (Mathematics)

This report consists of two papers on the theory of minimal including sums of boolean formulas. The first paper establishes some theorems covering the general question: when, and for what formulas G, is a given boolean sum minimal G--including. Some of the results are applied to the study of star formulas and will be used later on in study minimization theory. The second paper develops the theory of alternative and including sets. This theory is used to solve the problem of determining the minimal G--including sums for a given formula G. (Author)

AD-257 499 Div. 15
(12 June 61) OTS price $1.60

Personnel Lab., Wright Air Development Div., Lackland Air Force Base, Tex.
THE EXPLOITATION OF PERSONNEL DATA BY MEANS OF A MULTIPLE LINEAR REGRESSION MODEL,
by Robert A. Bottenberg. Dec 60, 10p. incl. tables.
(Proj. 7719)
(WADD TN 60-266) Unclassified report

DESCRIPTORS: *Mathematical prediction, Personnel, Equations, Data processing systems, Statistical functions, Functions, *Linear programming, Data.

An iterative program for determining weights in a multiple regression problem is described. Large scale regression problems can be economically computed while avoiding the problem of singularity altogether. Use of this program not only provides an effective way of obtaining weights to be used in a prediction equation, but also provides the basis for testing hypotheses. The characteristics of the computing program make it practical for the researcher to express his hunches in relatively complete detail in formulating a regression model. (Author)

AD-257 501 Div. 15
(12 June 61) OTS price $9.10

Mathematics Research Center, U. of Wisconsin, Madison.
THE 2k-p FRACTIONAL FACTORIAL DESIGNS,
by G. E. P. Box and J. S. Hunter. April 61, 101p. incl. illus. (MRC Technical summary rept. no. 218)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Combinatorial analysis, Matrix algebra, Statistical analysis, Sequential analysis, Factor analysis.

AD-257 503 Div. 15
(12 June 61) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE USE OF A DISTRIBUTION-FREE PROPERTY IN DETERMINING A TRANSFORMATION OF ONE VARIATE SUCH THAT IT WILL EXCEED ANOTHER WITH A GIVEN PROBABILITY,
by Sam C. Saunders. March 61, 22p. incl. illus. tables. (MRC Technical summary rept. no. 225)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Probability, *Transformations (Mathematics), Reliability, Topology, *Statistical analysis, Algebra.

AD-257 504 Div. 15
(12 June 61) OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
PERIODIC SOLUTIONS OF PERTURBED SECOND-ORDER AUTONOMOUS EQUATIONS. III,
by W. S. Loud. April 61. 34p. incl. illus. tables. (MRC Technical summary rept. no. 226)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Equations, Functions, Matrix algebra, Algebra, *Differential equations, Calculus of variations, Theory, Perturbation theory.

AD-257 505 Div. 15
(12 June 61) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
SOME THEOREMS ON THE INERTIA OF GENERAL MATRICES,
by A. Ostrowski and H. Schneider. April 61. 19p. incl. illus. tables (MRC Technical summary rept. no. 227)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Matrix algebra, Algebra, Differential equations, Equations, Transformations (Mathematics).

Division 16 - MEDICAL SCIENCES
16. MEDICAL SCIENCES

AD-256 926 Div. 16, 25
(5 June 61) OTS price $14.00

Armed Forces-NRC Committee on Hearing and Bio-Acoustics, Washington, D. C.
THE BIOLOGICAL EFFECTS OF VIBRATION,
by D. E. Goldman. Apr 61, 198p. incl. illus. tables, 111 refs.
(Contract Nonr-230005)
Unclassified report

DESCRIPTORS: Hearing, Acoustics, Injuries, *Vibration, *Shock waves, Measurement, Impact shock, Effectiveness, Exposure, Time, Pathology, *Stress (Physiology), Blast, Stimulation, Noise.

This report includes:
Naval Medical Research Inst., Bethesda, Md.
THE EFFECTS OF SHOCK AND VIBRATION ON MAN, by David E. Goldman and Henning E. Von Gierke.
8 Jan 60, 198p. (Lecture and Review Series no. 60-3)

This report discusses the effects of vibration on man. It summarizes briefly: (a) the measurement of vibration, (b) the production of controlled vibratory stimulation for research purposes, (c) the injurious effects of vibration, (d) discomfort due to vibration, (e) effects of vibration on task performance, and (f) beneficial uses of vibration. (Author)

AD-257 039 Div. 16
(8 June 61) OTS price $8.10

Syracuse U. Research Inst., N. Y.
AN INVESTIGATION OF CERTAIN MEANS OF SOUND ATTENUATION AT THE EAR,
by Josef J. Zwislocki. Rept. for 23 June 58-31 Dec 60. 1961, 1v. incl. illus.
(Contract Nonr-66911)
Unclassified report

DESCRIPTORS: *Ear, *Ear protectors, Sound, *Psychoacoustics, Attenuation, Intelligibility, Speech, Theory, Mathematical analysis, Effectiveness.

Contents:
Theory of sound attenuation at the ear
Theory of resonator earplugs
Development of resonator earplugs
Psychophysical evaluation of resonator earplugs
Physical evaluation of resonator earplugs
Psychophysical tests of the receiver-resonator system

AD-257 151 Div. 16
(2 June 61) OTS price $9.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
KNOCK-KNEES (Genu Valgum),
by Karl Bragard. 14 Dec 60, 114p. incl. tables.
(Trans. no. MCL-629 from Jnl. for Orthopedic Surgery 57:pp. 1-19; 47-65; 70-124; 192-199, 1932)
Unclassified report

DESCRIPTORS: *Orthopedics, Bone, Surgery, Therapy, *Joints (Physiology), *Legs, Pathology, Anatomy.

AD-257 172 Div. 16, 8, 15, 20
(5 June 61) OTS price $1.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
THE TIME CONSTANTS OF PEARL-CHAIN FORMATION,
by M. Saito and H. P. Schwan. 1960. 13p. incl. illus. table.
(Sponsored by Office of Naval Research)
Unclassified report

DESCRIPTORS: *Biophysics, Microwaves, Functions, Hazards, *Colloids, Particles, Dielectric properties, Physical chemistry, Equations, Intensity.

The time constants involved in the pearl-chain formation are of the order of a second for the radius of 1 micron, and they are porportional to the cube of the radius. The time constants are not strongly dependent on the field intensity when it is small, and they are inversely proportional to the square of the field intensity when it is large. The transition between the two regions occurs near the threshold. For particles of several microns or of larger sizes, the time constants become as large as hundreds of seconds, and consequently there exists a danger of observing erroneous threshold values in experimental works. The pulsed applied field is as effective as is expected from its r.m.s. value for usual radar systems. The hazards due to heat become pronounced before the field intensity is large enough for the pearl-chain to form if the particle size is less than 10 micron. The phenomenon of pearl-chain formation was considered of no biological significance in the area of microwave hazards due to radar exposure. (Author)

AD-257 181 Div. 16
(5 June 61) OTS price $1.60

Washington U., Seattle.
ON THE TRANSFER FUNCTION OF HUMAN SKIN,
by Konrad J. K. Buettner. Annual rept. 1960. 16p. incl. tables.
(Contract DA 18-108-405-cml-666)
Unclassified report

DESCRIPTORS: *Skin, Man, Penetration, Water, Water vapor, Absorption, Gases, Vapors, Oxygen, Carbon dioxide, Vapor pressure, Alcohols, Carbon tetrachloride, Solutions, Impedance, Electrical properties, Boric acids, Alkali metals, Measurement, Test methods, Physiology.

This report tries to clarify aspects of skin penetration. The transfer of water seems to differ drastically from that of other substances. Water and water vapor are believed to move through intact skin surface by: (a) glandular secretion such as sweat gland; (b) sorption and desorption in the horny layer; and (c) diffusion through the horny layer. The following conclusions, however, may tentatively be drawn: (a) every effort has failed as yet to dispute the fact that water from surprisingly strong solutions or from air of 90% relative humidity or more enters human and animal skin; (b) the stratum corneum conjunctum of the human arm seems to be, or at least to contain, the barrier for water and for electric current; (c) the same seems not to be the case for alcohol vapor; (d) the skin seems in vivo and in vitro rather impenetrable for all tested water solutes; and (e) observed damages of living skin are listed, and damage to conjunctum in vitro is known to be caused by: (1) very low humidity; (2) very high humidity; and (3) tartaric acid. (Author)

AD-257 198 Div. 16, 8
(6 June 61) OTS price $8.10

Biophysics Lab., Tulane U., New Orleans, La.
THE NEURAL EFFECTS OF MICROWAVE IRRADIATION,
by Robert T. Nieset, Lawrence R. Pinneo and others. Annual rept. Nov 60, 81p. incl. illus. tables, 23 refs.
(Contract AF 30(602)1965, Proj. 5545)
(RADC TR 61-65) Unclassified report

DESCRIPTORS: *Microwaves, *Radiation effects, *Nervous system, Nerves, Measurement, *Radiometers, Design, Temperature, *Tissues (Biology), Tests, Electrodes, Histological sections.

Microwave radiation has previously been shown to stimulate certain fibers of the peripheral nervous system. This is a nociceptive effect and is associated with the local heating of tissue to about 45 C. The nerves affected were found to be undamaged by microwave heating in spite of temporary damage to supporting tissue. The steady potentials of the central nervous system were found to change with the heating of peripheral nerve structures. The possibility for inducing changes in the steady potentials directly was considered, particularly in relation to certain microwave frequencies and pulse durations. Special electrodes were developed for long term measurement of cortical steady potentials in animal experiments. A radiometer was designed for the remote measurement of tissue surface temperature. This device is designed to indicate localized temperature increases such as might be expected in poorly vascularized regions with mocrowave irradiation. (Author)

AD-257 272 Div. 16, 20
(9 June 61) OTS price $1.60

Naval School of Aviation Medicine, Pensacola, Fla.
A NOTE ON THE RBE OF PROTON RADIATION IN SPACE,
by Hermann J. Schaefer. 10 Jan 61, 11p. incl. illus. (Rept. no. 18)
(Proj. MR005.13-1002) Unclassified report

DESCRIPTORS: *Space flight, *Radiation hazards, Protons, *Proton beams, Neutrons, Fission neutrons, Energy, *Tissues (Biology), Nuclear energy, Van Allen radiation belt, Solar flares, Radiobiology.

The Code of Federal Regulations prescribes an relative biological effectiveness (RBE) of 10 for high energy protons. This would lead to enormous rem doses in human target exposed to flare-produced and other proton fluxes in space. Evaluation of the intratarget energy and lineal energy transfer (LET) spectra of these fluxes and interpretation in terms of RBE dose shows that proton beams in space, quite contrary to recoil protons from fission neutrons, contain only a small fraction of low-energy particles. As a consequence, the RBE factor remains below 1.5. Only in the very surface of freely exposed targets can significantly higher RBE values occur. (Author)

AD-257 273 Div. 16
(9 June 61) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
AEROMETEORISM: A FOLLOW-UP REPORT,
by Catherine F. Kasparek and Ashton Graybiel. 16 Jan 61, 6p. incl. table, (Rept. no. 2)
(Proj. MR005.13-3001)
Unclassified report

DESCRIPTORS: *Falling bodies, *Aviation accidents, *Aviation injuries, *Casualties, Hazards, Statistical analysis.

As a follow-up to one published in 1954, this report presents the trend in aerometeorism since that time. Death has occurred to 287 persons and injury to 622 as a result of falling aircraft or falling fragments of aircraft in the period 1953-1959. Various examples of the accidents which caused the aerometeorism are cited. (Author)

AD-257 275 Div. 16
(9 June 61) OTS price $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
MAXIMUM BREATHING CAPACITY PREDICTION FROM THE VELOCITY-VOLUME LOOP,
by Roscoe G. Bartlett, Jr., Norman E. Phillips, and Eugene J. Wolski. 3 Jan 61, 24p. incl. illus. tables (Rept. no. 2)
(Proj. no. MR005.13-3100)
Unclassified report

DESCRIPTORS: Lungs, Physiology, *Respiration, Measurement, Oscilloscopes, Tests.

Because of the relationship of the maximum breathing capacity (MBC), velocity-volume (V-V) loop to the forced vital capacity (maximum) V-V loop, it is possible to simulate the MBC V-V loop by erecting perpendiculars at either end of the tidal volume. When MBC V-V loops are simulated for various tidal volumes, the MBC may be predicted at over a wide range of breathing frequencies. The predicted MBC values calculated from a single maximum V-V compare favorably with MBC values obtained with the usual fifteen-second MBC test. (Author)

AD-257 276 Div. 16
(9 June 61) OTS price $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
PULMONARY FUNCTION EVALUATION IN AIR AND IN SPACE FLIGHT,
by Roscoe G. Bartlett, Jr. 23 Feb 61, 25p. incl. illus. tables (Rept. no. 3)
(Proj. MR005.13-3100)
Unclassified report

DESCRIPTORS: *Respiration, Measurement, Lungs, Physiology, Space flight, Aviation personnel, Monitors, Tests.

Ideal monitoring of pulmonary function allows constant surveillance with a minimum of equipment of a pilot or astronaut. A velocity-volume (V-V) loop synthesized from a telemetered pneumotachogram permits the assessment of the following measurements: vital capacity, expiratory reserve volume, inspiratory reserve volume, inspiratory capacity, tidal volume, and air trapping, timed inspiratory and expiratory vital capacities, inspiratory and expiratory reserve velocities, maximum peak inspiratory and expiratory velocities, breath accelerations, and a reliable maximun breathing capacity prediction at any breathing frequency. (Author)

Division 16 - MEDICAL SCIENCES

AD-257 290 Div. 16, 14, 30
(8 June 61) OTS price $1.60

School of Aviation Medicine, Brooks Air Force Base, Tex.
METHOD FOR PRODUCING WETTABLE SURFACES ON CONTACT LENSES BY CHEMICAL FORMATION OF INORGANIC FILMS,
by Robert A. Erb. Mar 61, 11p. incl. illus. tables (Rept. no. 61-42)
(In cooperation with The Franklin Inst., Philadelphia, Pa.)
Unclassified report

DESCRIPTORS: *Contact lenses, Surface properties, Films, Inorganic substances, Deposits, Coatings, Titanium compounds, Dioxides, Moisture, Thin films, Adhesion, Instrumentation.

Wettable surfaces of a permanent nature can be produced on contact lenses by means of the technic of chemical deposition of an inorganic film on the lens surface. The process is simpler, both in apparatus and procedure, than the vacuum deposition technic designed earlier for producing wettable surfaces on plastic lenses; the new process should have wide application. This report summarizes the factors involved in the process of coating a poly(methyl methacrylate) substrate with a thin film of titanium dioxide which has the properties desired-that is, transparency, wettability, adhesion, and immersion resistance. Stepwise instructions are given for the preparation of hydrophilic surfaces on contact lenses. The equipment developed for this work is relatively simple and inexpensive. (Author)

AD-257 291 Div. 16
(8 June 61) OTS price $1.10

School of Aviation Medicine, Brooks Air Force Base, Tex.
PROLONGED HYPOTHERMIA,
by F. John Lewis. Apr 61, 5p. incl. table, 15 refs. (Rept. no. 61-45)
(In cooperation with Northwestern U. Medical School, Chicago, Ill.)
Unclassified report

DESCRIPTORS: *Hypothermia, Production, Maintenance, Survival, Reserpine, Anesthetics, Pharmacology.

An automatic control system was used to maintain the body temperature of dogs below 25 C. for 20 hr. Once this low temperature was reached no anesthesia other than hypothermia was required. Blood pressure and pulse rate remained low throughout the cooling periods and as time passed the hematocrit rose, plasma volume fell, pH fell, and venous oxygen saturation fell. Of the 98 dogs cooled in this fashion, 31 survived rewarming. A number of agents and medications have been used in trying to increase the survival rate. Best results were achieved with the most recent technic which features a number of small changes such as deeper anesthesia during induction of hypothermia. Reserpine also may have contributed to a higher survival rate. (Author)

AD-257 292 Div. 16
(8 June 61) OTS price $1.10

School of Aviation Medicine, Brooks Air Force Base, Tex.
RENAL CLEARANCE OF SODIUM AND POTASSIUM IN HYPOTHERMIA,
by G. S. Kanter. Mar 61, 9p. incl. illus. tables, 37 refs. (Rept. no. 61-47)
(In cooperation with Albany Medical Coll., Albany, N. Y.)
Unclassified report

DESCRIPTORS: *Hypothermia, *Kidneys, Excretion, Physiology, *Electrolytes (Physiology), Sodium, Potassium.

The renal tubular handling of Na and K at various hypothermic levels was studied. Fourteen dogs were anesthetized with 30 mg./kg. of sodium pentobarbital. After suitable control clearance measurements, the rectal temperature was lowered progressively by ice-packing to about 25 C. while continuous renal clearance studies were carried out. Artificial respiration was not used. No change in plasma Na was detected but plasma K fell significantly from a control value of 4.1 mEq./liter + or - 0.09 at 38 C. to 3.4 mEq./liter + or - 0.12 at 25 C. Urine Na concentration fell during exposure to cold while K concentration showed a small increase. In spite of the marked fall in glomerular filtration rate (69.0 ml./min. + or - 3.1 control to 17.0 ml./min. + or - 3.6 at 25 C.) the final urine flow at 25 C. was slightly greater than that of the control. The E/F ratios (ratio of excreted to filtered) for Na, K, and H2O increased significantly, reflecting the marked decrease in general tubular reabsorption. The E/F for H2O increased from 0.49 + or - 0.05 at 38 C. to 2.02 + or - 0.25 at 25 C., the E/F for Na increased from 0.47 + or - 0.12 at 38 C. to 1.13 + or - 0.27 at 25 C., while the E/F for K increased from 18.0 + or - 2.6 at 38 C. to 54.0 + or - 12.0 at 25 C. The variation in effect of hypothermia on the E/F ratios is a reflection of the renal regulations occurring as well as the differing reabsorptive mechanisms. (Author)

AD-257 293 Div. 16
(8 June 61) OTS price $1.60

School of Aviation Medicine, Brooks Air Force Base, Tex.
MICROBIOLOGIC STUDIES WITH OZONE. QUANTITATIVE LETHALITY OF OZONE FOR ESCHERICHIA COLI,
by Irving Davis. Mar 61, 16p. incl. illus. tables, 39 refs. (Rept. no. 61-54)
Unclassified report

DESCRIPTORS: *Ozone, *Cells (Biology), *Escherichia, Atmosphere, Microorganisms, Absorption, Survival, Analysis of variance, Solutions.

A series of studies designed to provide an understanding of the biologic activity of ozone at the cellular level is described. A critical analysis of the quantitative lethality of ozone was undertaken. Maximum lethal effects of ozone over a wide concentration range were expressed in 1 minute or less on the bacterial population. The number of cells surviving exposure is a function of approximately the cube of the initial cell concentration. This holds true over a wide

range of ozone values. Percent kill increased sharply over a narrow range of ozone concentrations, and then leveled off. The ozone tolerance of strains B and B/r of Escherichia coli appears to be similar, if not identical. Several factors which contribute to an understanding of the biologic activity of ozone are presented. The importance of free radicals in biologic processes is discussed. Literature on the formation of these radicals during the absorption of ozone in aqueous solution is reviewed. (Author)

AD-257 294 Div. 16
(8 June 61) OTS price $1.10

School of Aviation Medicine, Brooks Air Force Base, Tex.
A MODIFIED CARLSON-CRITTENDEN DEVICE FOR THE COLLECTION OF PAROTID FLUID,
by Ira L. Shannon, John R. Prigmore and Howard H. Chauncey. Apr 61, 5p. incl. illus. 16 refs.
(Rept. no. 61-57)
(In cooperation with Tufts Coll. of Dental Medicine, Boston, Mass.)
Unclassified report

DESCRIPTORS: *Saliva, Collecting methods, Medical equipment, Instrumentation.

Directions are given for the fabrication, cleaning, and sterilizing of a modified Carlson-Crittenden parotid fluid collecting device that has been use-tested by the authors in the collection of over 40,000 specimens. It has served particularly well in prolonged collections made with exogenous stimulants. The size of the device is such that it is easily adapted for use in making collections from dogs and other large experimental animals. (Author)

AD-257 295 Div. 16, 20
(8 June 61) OTS price $1.10

School of Aviation Medicine, Brooks Air Force Base, Tex.
RADIOPROTECTIVE AGENTS. ANALYSIS OF THE POTENTIAL ANTIRADIATION EFFECT OF NUCLEIC ACIDS OR THEIR PRECURSORS,
by Donald E. Rounds. Apr 61, 4p. incl. tables.
(Rept. no. 61-58)
(In cooperation with Pasadena Foundation for Medical Research, Pasadena, Calif.)
Unclassified report

DESCRIPTORS: *Nucleic acids, *Purines, *Pyrimidines, Nucleosides, Adenine, Control, *Radiation injuries, *Preventive medicine, Countermeasures, *Radiation effects, Drugs, Gamma rays.

A total of nine compounds, including nucleic acids, purines, pyrimidines, and one nucleoside, were tested in vitro for activity as radioprotective agents. One agent which proved to be effective was yeast ribonucleic acid (RNA). Four others, which showed moderate potential, were calf thymus deoxyribonucleic acid (DNA), yeast DNA, orotic acid, and adenine. Guanine, xanthine, uracil, and deoxyadenosine had no protective effect in the test system. Yeast RNA was found to be relatively nontoxic to amnion cells over a 24-hr treatment period, but a chronic exposure of the cells to 0.5 mg./ml. for 6 days caused a decrease in the growth rate to about 52% of control cultures. Preirradiation treatment of seven different cell strains with 0.1 mg./ml. yeast RNA resulted in a widely variable protective response. Treated populations of nonmalignant origin showed more cells surviving 700 r gamma radiation than did untreated, irradiated control cultures. Malignant cells-including KB, HeLa, and Detroit 6 strain of bone marrow-showed no protective response. (Author)

AD-257 301 Div. 16
(9 June 61) OTS price $1.10

Peter Bent Brigham Hospital, Boston, Mass.
METABOLIC DISORDERS AND THERAPEUTIC APPROACHES IN RENAL FAILURE,
by John P. Merrill. Rept. for 1 Sep 60-1 May 61. 1 May 61, 4p.
(Contract DA 49-007-md-429)
Unclassified report

DESCRIPTORS: *Metabolism, *Pathology, *Kidneys, Therapy, Skin, Transplantation, Fructose, Leukocytes, Antigens, Thyroid hormones, Phosphates, Uremia, Artificial kidney, Bone marrow, Injection, Immunization.

Following supra lethal x-irradiation in dogs, the re-injection of autologous marrow removed before irradiation does not prolong the life of kidney homografts. Injection of homogenate of the contralateral kidney inhibits the increase in weight seen in the control animal's remaining kidney following nephrectomy. Cortisone treatment prolongs the survival of skin homografts in rabbits. In studies of fructose clearance in dogs a tubular maximum for fructose reabsorption was demonstrated. Pre-immunization of ambulatory adult volunteers with human leukocytes show acceleration of skin grafts subsequently placed from the donors. Sequential study has been made in man of the development of first set accelerated and white graft rejection patterns in skin homografts. Twelve arterio-venous bypass catheters have been placed for the facilitation of hemodialysis in acute and chronic uremia. In one patient such a shunt remained in place for 112 days and a second shunt for 71 days. In the other patients problems of clotting and infection necessitated removal before adequate therapy with dialysis could be obtained. In the patient whose shunts remained in for the periods of 112 and 71 days useful prolongation of life was obtained in spite of chronic terminal uremia. (Author)

AD-257 323 Div. 16
(8 June 61) OTS price $2.60

Presbyterian-St. Luke's Hospital, Chicago, Ill.
SERIAL CORRELATIONS OF THE CHEMICAL ANATOMY OF HEPATIC AND RENAL CELLS WITH ORGAN STRUCTURE AND CLINICAL STATUS IN MAN,
by Robert M. Kark. Progress rept. for 1 Apr 60-31 Mar 61. 31 Mar 61, 9p. tables, 18 refs.
(Contract DA 49-007-md-637)
Unclassified report

DESCRIPTORS: *Kidneys, *Liver, Biochemistry, *Enzymes, *Hepatitis, Man, Dogs, Test methods, Quantitative analysis, Pathology.

Data on lactic dehydrogenase, glutamic oxalacetic transaminase, and sorbitol dehydrogenase have been obtained in the anatomical portions of the normal liver lobule in man. Data has been obtained on the enzyme activities of the various anatomical portions of the nephron in healthy dogs and man. The data has been compared with the findings in renal tubular acidosis and hepato-lenticular degeneration. In addition, data has been obtained on healthy human kidneys after the production of metabolic acidosis by classical ammonium chloride loading techniques. The data suggests that carbonic anhydrase is not the key enzyme deficiency in renal tubular acidosis. In hepato-lenticular degeneration there were no significant abnormalities in glutamic oxalacetic transaminase, glutamic pyruvic transaminase, and glutamic dehydrogenase activities -- enzymes which might have been expected to be involved in a disorder with gross amino aciduria. Studies have also been done on antinuclear factors in the serum of patients with hepatic disease. (Author)

AD-257 329 Div. 16
(7 June 61) OTS price $1.60

Harvard U. Medical School, Boston, Mass.
EFFECTS OF ANESTHETIC AGENTS IN MAN: A STUDY OF NEUROVASCULAR RESPONSES AND INTERMEDIARY METABOLISM,
by Leroy D. Vandam and Dorothy H. Henneman. Final rept., 1 May 57-30 Apr 61. 30 Apr 61, 12p. 11 refs.
(Contract DA 49-007-md-798; In cooperation with Peter Bent Brigham Hospital, Boston, Mass.)
Unclassified report

DESCRIPTORS: *Anesthetics, Carbohydrates, *Metabolism, Blood circulation, Heart, Surgery, Man Muscles, Acidosis, Blood pressure, Pathology, *Physiology, Corticosteroids.

AD-257 369 Div. 16
(12 June 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
BIOPROBE DEVELOPMENT AND STUDY WITH LETTER REPORT CONCERNING LIFE SUPPORT SYSTEM,
20 May 60, 13p. incl. illus. table (Rept. no. NADC-MA-L6007, Rept. no. MA-4-3870)
(Proj. TED no. ADC AE 1412.2)
Unclassified report

DESCRIPTORS: *Closed cycle ecological systems, Design, Air, Diet, Urine, Excretion, Temperature, Atmosphere, Simulation.

AD-257 372 Div. 16
(12 June 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
EYE PROTECTION FOR NUCLEAR WEAPONS DELIVERY PILOTS, INFLIGHT RESEARCH STUDIES TO OBTAIN QUANTITATIVE PERFORMANCE DATA.
Progress rept. 21 Sep 60, 10p. incl. illus. tables (Rept. no. NADC-MA-L6035, rept. no. MA-82-7058)
Unclassified report

DESCRIPTORS: *Pilots, Atomic bomb explosions, *Blindness, Vision, Inhibition, Safety, Test methods, Light, Intensity, *Eye, Flight.

AD-257 391 Div. 16
(12 June 61) OTS price $1.60

Air Force Missile Development Center, Holloman Air Force Base, N. Mex.
PHYSIOLOGICAL BASE-LINE STUDIES OF ZOOLOGICAL SPECIMENS. CLINICAL OBSERVATIONS AND METHODS USED IN THE TREATMENT OF YOUNG CHIMPANZEES,
by Jerry Fineg, William E. Britz and others, Apr 61, 15p. incl. illus. (Rept. no. AFMDC TR 61-12)
(Proj. 6892)
Unclassified report

DESCRIPTORS: *Primates, *Veterinary medicine, Handling, Diseases, Therapy.

Techniques for the care and handling of chimpanzees have been developed in an effort to maintain a standardized colony for various USAF research projects. This report covers the second part of the physiological base-line studies of zoological specimens under this project. (Author)

AD-257 467 Div. 16
(12 June 61) OTS price $1.60

Naval Medical Research Unit no. 2, Taipei, Taiwan.
CHOLERA AND THE SODIUM PUMP,
by G. S. Huber and R. A. Phillips. 1 Nov 60, 9p. incl. illus. 15 refs. (Research rept. no. MR 005.09-1040.1.7)
Unclassified report

DESCRIPTORS: *Cholera, Vibrio, Dehydration, Biophysics, *Sodium, Pumps, *Medical equipment, *Skin, Ions, Electrolytes (Physiology), *Transport properties, Diffusion, Membranes.

Data are presented showing the unique action of Vibrio cholera and/or its products on the sodium transport mechanism of the isolated frog skin. Some notions based on the Na/K pump theory of Koefoed-Johnsen and Ussing are evolved to explain the results. These notions and some of their consequences are discussed in relation to the clinical pathology of cholera as reported in the literature. (Author)

AD-257 482 Div. 16
(12 June 61) OTS price $1.60

Rochester U. School of Medicine and Dentistry, N. Y.
BASIC QUANTITATIVE STUDIES OF SEVERE HYPOTHERMIA,
by E. F. Adolph. Final rept. 1951-1961. 1 June 61, 16p. 37 refs. (Proj. rept. no. 19)
(Contract DA 49-007-md-155)
Unclassified report

DESCRIPTORS: *Hypothermia, Physiology, Cooling, Heating, Respiration, Vagus nerve, Inhibition, Heart, *Stress (Physiology), Oxygen consumption, Tissues (Biology), Mammals, Survival, Metabolism, Blood, Metabolic products, Oxygen.

Small mammals, especially rats, were exposed to cold air or to surface cooling. Adaptation was induced by significant colling, and four criteria of adaptation were employed to investigate its onset and decay. Hypothermia of 2 to 10 C could be endured for about 1 hr and at higher temperatures up to 25 C for progressively longer times,

even 72 hours. In each instance survival after rewarming was required as criterion of endurance. Oxygen supply to tissues was especially investigated; oxygen was transported by the blood as long as the circulation continued, the heart usually reversibly ceased to beat at 7 C. But the oxygen was found not to reach all tissues, as was seen in the cessation of blood flow at 10 -15 C in some minute vessels, and in the frequent failure of a tissue oxygen electrode to vary its apparent oxygen tension when the lungs were filled with oxygen or with nitrogen. Several processes were affected disproportionately by cooling so that distortion among them resulted. (Author)

AD-257 533 Div. 16
(13 June 61) OTS price $1.10

Genoa U. (Italy)
SPONTANEOUS AND INDUCED ELECTROENCEPHALOGRAPHIC ACTIVITY DURING PHYSIOLOGICAL SLEEP OF THE CAT,
by G. F. Rossi, T. Hara and others. 25 Oct 60, 3p. (Technical note no. 1)
(Contract AF 61(052)461)
(AFOSR-350) Unclassified report

DESCRIPTORS: Cats, *Sleep, Electroencephalography, *Cerebral cortex, Electrical properties, Muscles, Inhibition, Physiology.

Recent experimental work has shown that in the cat the deepest stage of sleep is electroencephalographically characterized by low voltage fast rhythms, similar to those occurring during wakefulness, and by complete disappearance of muscular tonus. This has been fully confirmed by several findings obtained in our laboratory. The present research has been undertaken with the aim to study the nervous mechanisms underlying this deepest sleep. More particularly, experiments have been done to study the mechanisms responsible for the desynchronization of the electrocortical activity characterizing it. (Author)

AD-257 540 Div. 16
(13 June 61) OTS price $1.60

Johns Hopkins U., Baltimore, Md.
(No title).
Progress rept., 1 Jan 61-31 Mar 61. 31 Mar 61, 14p. incl. tables.
(Contract DA-18-064-404-cml-100, Proj. 4161-09-004)
Unclassified report

DESCRIPTORS: *Staphylococcus, Bacterial toxins, Antigens, Antibodies, *Pneumococcus infections, Bacteremia, Immunization, *Communicable diseases, Penicillin, *Antibiotics, Heparin, Suppurative infections, Arthritis, Therapy.

Contents:
The emergence of a new strain of hospital staphylococcus
The evaluation of synthetic penicillins
Studies of an intramuscular vancomycin preparation
Studies on the mechanism of the febrile response to endotoxin
Studies on tuberculous serous effusions
Effect of naturally occurring antibody on the biological activity of endotoxin and host response to gram negative bacteria
Bacterial pyarthrosis
Studies on the mechanism of death in pneumococcal infections
Inhibition of the coagulase reaction of pathogenic staphylococci by heparin in vitro

AD-257 542 Div. 16
(13 June 61) OTS price $1.60

Nobel Inst. for Neurophysiology (Sweden).
RESEARCH ON BRAIN STEM MECHANISMS REGULATING AUTOMATIC ACTIVITIES,
by Ulf Soderberg. Technical summary rept. 6 Feb 61, 10p.
(Contract AF 61(052)119)
(AFOSR-507) Unclassified report

DESCRIPTORS: *Brain, *Blood circulation, Motor reactions, Physiology, Nervous system, Stimulation, Arteries, Heart, Measurement, *Neuromuscular transmission, Blood pressure, *Autonomic nervous system.

Contents:
Cardiovascular studies
Measurement and regulation of cerebral blood flow
Brain stem reflexes
Brain stem influences on the lateral geniculate body

AD-257 578 Div. 16, 20
(16 June 61) OTS price $3.60

Naval Medical Research Inst., Bethesda, Md.
PHARMACOLOGICAL STUDIES ON IRRADIATED ANIMALS. X. EFFECTS OF CELL-FREE SPLEEN EXTRACT TREATMENT ON HEMATOPOIETIC TISSUES OF IRRADIATED GUINEA PIGS,
by F. Ellinger and T. Strike. 4 Nov 60, vol. 18, pp. 473-512, incl. illus. tables, 28 refs. (Rept. no. 5)
(Proj. MR 005.08-1300.03)
(Rept. no. DASA-516) Unclassified report

DESCRIPTORS: Spleen extract, *Bone marrow, *Radiation injuries, Gamma rays, Therapy, Survival, Histology, *Spleen, Pharmacology, Tissues (Biology), Reticulo-endothelial system.

Qualitative and quantitative histological and histochemical evidence is presented which indicates that cell-free saline spleen extracts modify radiation induced changes in the spleen and bone marrow of guinea pigs following exposure to an LD75/20 of Co60 gamma radiation. Post-irradiation treatment with homologous or heterologous (mouse) spleen extract accelerates the natural recovery process of the spleen and bone marrow of guinea pigs, while the initial effect remains unchanged. Histological findings give the impression that this accelerated recovery process is due to a stimulatory effect of the spleen extract on stem cells. Histochemical studies indicate that spleen extracts also modify the radiation effect on the alkaline

phosphatase staining cells of the spleen. Since homologous or heterologous extracts produce similar results, a common mechanism of recovery has been postulated. Study of the temporal sequence of changes indicates that recovery processes in spleen precede those in bone marrow, thus indicating a hierarchy of events. The significance of these findings for biology and clinical medicine is discussed. (Author)

AD-257 595 Div. 16
(13 June 61) OTS price $1.60

School of Aviation Medicine, Brooks Air Force Base, Tex.
EFFECT OF PROPYLTHIOURACIL TREATMENT AND ADRENALECTOMY ON HEAT PRODUCTION AND HEAT LOSS DURING ACUTE EXPOSURE TO COLD,
by M. J. Fregly, P. F. Iampietro and A. B. Otis. Apr 61, 9p. incl. illus. table, 26 refs. (Rept. no. 61-46)
(In cooperation with Florida U. Coll. of Medicine, Gainesville and QM Research and Engineering Center, Natick, Mass.)
Unclassified report

DESCRIPTORS: *Exposure, Thyroid gland, Adrenal glands, Excision, Metabolism, Body temperature, Body, Cooling, *Thiouracils, Oxygen consumption, Measurement, Heat production (Biology), Physiology.

Thyroidectomy (propylthiouracil treatment) and adrenalectomy increased rate of cooling of rats restrained and subjected to air at 5 C. At the same colonic temperature during cooling, both thyroidectomized and adrenalectomized rats maintained higher skin temperatures than did control rats. Heat production (measured by oxygen consumption) was determined for thyroidectomized and control rats only. At the same colonic temperatures during cooling thyroidectomized rats had the same heat production as controls. Calculation of heat loss at a given colonic temperature during cooling, however, revealed it to be greater for thyroidectomized than for control rats. The inability of thyroidectomized rats to tolerate cold as well as the control rats did under these conditions is due almost entirely to a more rapid loss of body heat. Failure to conserve heat may be related to changes in vascular reactivity induced by the hypothyroid state. (Author)

17. METALLURGY

AD-256 921 Div. 17, 27
(5 June 61) OTS price $1.60

Aerojet-General Corp., Azusa, Calif.
INVESTIGATION OF STRESS-CORROSION CRACKING OF HIGH-STRENGTH ALLOYS.
Informal progress rept. no. 7, 1-30 Apr 61, 25 May 61, 4p. tables (Rept. no. L0414-01-7)
(Contract DA 04-495-ORD-3069)
Unclassified report

DESCRIPTORS: *Rocket cases, Stainless steel, *Heat resistant alloys, *Corrosion research, Materials, Steel, Titanium alloys, Welding, Corrosion, Stresses, Fracture (Mechanics), Mechanical properties, Corrosion inhibition, Corrosive liquids, Corrosive gases, Surface properties, Microstructure, Atmosphere.

Bent beam stress-corrosion test data are presented for Vascojet 1000 alloy steel and B120VCA Ti alloy. The steel testing environments included air, tap water, distilled water, NaCl solution, sodium dichromate solution, marquench salt solution, soluble oil solution, trichloroethylene, and cosmoline. The Ti alloy was tested under similar environments. Mechanical property data are presented for AM335 stainless steel, 300M alloy steel, and PH 15-7 Mo stainless steel. Failures were encountered with the Vascojet alloy steel at 175,000 to 180,000 psi in tap water, distilled water, and the NaCl solution.

AD-257 104 Div. 17
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METALLURGY OF RARE METALS (Metallurgiay Redkikh Metallov),
by I. P. Kislyakov. Oct 60, 24p. incl. illus. tables (Trans. no. MCL-5 from Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'Stvo Literatury Po Chernoy i Tsvetnoy Metallurgii pp: 186-204, 1957)
Unclassified report

DESCRIPTORS: *Metals, *Metallurgy, USSR, Chemical properties, Physical properties, Photoelectric materials, Semiconductors, Metal coatings, Purification, Solvent extraction, Zone melting, Bearings, Soldering alloys, Sources, Cesium, Gallium, Germanium, Hafnium, Indium, Rhenium, Rubidium, Thallium.

The elements Rb, Ce, Ga, In, Th, Ge, Hf and Re are classified by the author as dispersed (diffused) metals. They are characterized by the fact that there are no natural deposits and they are found in various degrees of concentration in the deposits of other rare, ferrous, and nonferrous metals, and sometimes in nonmetals. Many of them possess no natural minerals, or have only a small amount of them, and are found basically in a varied form of admixture in the minerals of related elements (isomorphism, entering the lattice in a form of solid solution). The basic physical and chemical characteristics of the dispersed metals are tabulated. The sources, methods of extraction (metallurgy), and industrial applications of these metals are discussed.

AD-257 114 Div. 17
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
KINETICS AND MECHANISM OF HIGH-TEMPERATURE OXIDATION OF RHENIUM IN THE RECRYSTALLIZED AND COLD-WORKED STATES (Kinetika I Mekhanizm Visokotemperaturnogo Okislyuvannya Reniyu V. Rekristalizovanomu Ta Naklepanomu Stanakh),
by V. O. Lavrenko. 18 Oct 60, 8p. incl. illus. table, 10 refs. (Trans. no. MCL-308 from Dopovidi Akademii Nauk Ukrainskoy RSR 11:1216-1220, 1958)
Unclassified report

DESCRIPTORS: USSR. *Rhenium *Oxidation, Powder metals, Processing, Deformation, Crystallization, Electrochemistry, High temperature research, Hardening.

The kinetics of oxidation of Re in the recrystallized and the cold-worked conditions were investigated at temperatures from 350 to 725 C. Oxidation isotherms were obtained by the method of continuous weighing for exposure times up to 50 hr. Hardening, by cold deformation from 21.9 to 53.0 Rockwell C, showed a definite accelerating effect on the formation and subsequent vaporization of Re oxides. At all temperatures, the rate of Re oxidation followed a linear relationship since there was no protective action from the constantly renewing film of ReO3 and Re2O7 oxides which melt at 160 and 296 C, respectively.

AD-257 122 Div. 17
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PLASTIC DEFORMATION IN SINTERING OF SILVER POWDER BODIES (Pro Nayavnist' Plastichnoi Deformatsii Pri Spikanni Poristikh Til Iz Sribla)
by R. O. Andriyevs'kiy and I. M. Fedorchenko.
21 Oct 60, 7p. incl. illus. (Trans. no. MCL-365 from Dopovidi Akademii Nauk Ukrains'koi RSR 5:531-534, 1958)
Unclassified report

DESCRIPTORS: *Powder metals, Plasticity, Deformation, Silver, USSR, Powder metallurgy, Stresses, Creep, Viscosity, Sintering, Mechanical properties, Physical properties.

Results are presented of an investigation of the effect of uniaxial tensile and compressive stresses on the kinetics of shrinkage during sintering of powder metal compacts. The experiments were conducted on compacts of electrolytic Ag powder of a 44-micron fraction with a porosity of 30%. The sintering temperature was 900 + or - 10C. Tensile stresses were varied from 0 to 1.1 x 10 to the 6th power dynes/sq cm during heating periods of 6 min. At a tensile stress of 1 x 10 to the 6th power dynes/sq cm linear shrinkage ceased and elongation began. Volume shrinkage increased despite decreasing linear shrinkage until elongation began, then volume shrinkage decreased. Similar results were obtained when compression was applied. An analysis of the data indicated that plastic deformation does not effect the kinetics of shrinkage for short exposure.

AD-257 130 Div. 17
(5 June 61) OTS price $4.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEMS OF METALLOGRAPHY AND PHYSICS OF METALS (SELECTED ARTICLES).
28 Oct 60, 88p. incl. illus. tables (Trans. no. MCL-457 from Problemy Metallovedeniya I Fiziki Metallov: pp. 100-116, 117-136, 169-186, 187-190, 1959)
Unclassified report

DESCRIPTORS: USSR, *Metallurgy, Metals, Crystallization, Ultrasonics, Mechanical properties, Deformation, Steel, Vacuum furnaces, Melting, Casting, Gases, Pressure, Vibration, Castings.

Contents:
The action of ultrasonic vibrations on the crystallization of ingots, by V. I. Leont'yev
The effect of elastic vibrations on structure during crystallization, and on mechanical properties and deformability of steels X27 and X25H20, by Ya. B. Gurevich, V. I. Leont'yev and I. I. Teumin
On the question of the effect of vacuum smelting and casting on the properties of metals and quality of ingots, by A. V. Emyashev, A. M. Zubko and V. E. Neimark
On the effect of inert gas pressure in the furnace on the content of gases in metal, by A. N. Zelevnov and D. S. Kamenetskaya

AD-257 131 Div. 17
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
JOURNAL OF INORGANIC CHEMISTRY (SELECTED ARTICLES).
28 Oct 60. 24p. incl. illus. tables, 35 refs. (Trans. no. MCL-460 from Zhurnal Neorganicheskoy Khimii 4:pp. 1967-1969, 2052-2057, 2169-2171, 1959)
Unclassified report

DESCRIPTORS: *Borides, Boron alloys, *Carbides, *Nickel alloys, *Aluminum alloys, Lattices, Crystal structure, Chemical bonds, Phase transitions, Electrons, Alkaline earth metals, Rare earth compounds, Phase studies, Resistance, *Cermets, Copper, Nickel, Adsorption, Physical properties, Processing, USSR, Molecular structure, Wetting agents, Liquid metals.

Contents:
The problem of the electron structure and conditions for forming borides of the MeB6 type, by V. S. Neshpor, G. V. Samsonov
Wettability of borides and carbides by liquid metals, by V. N. Yeremenko and Yu. V. Naydich
Nickel-aluminum alloy with a low coefficient of linear expansion, by I. I. Kornilov and R. S. Mints.

AD-257 132 Div. 17
(5 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTROPLATING WITH ALLOYS,
by P. M. Vyacheslavov. 31 Oct 60, 10p. (Trans. no. MCL-464 from Gal'vanicheskiye Pokrytiya Splavami (Chapter III) pp. 26-30, 1959)
Unclassified report

DESCRIPTORS: *Nickel alloys, *Cobalt alloys, *Magnetic alloys, *Electroplating, USSR, Electrodeposition, *Phosphorus alloys, Hardness, *Corrosion resistant alloys, Corrosion.

Electroplated coatings of Ni-Co and Ni-P alloys are reported to be harder and more corrosion resistant than Ni coatings. Recommendations are presented for the preparation of magnetic alloys of Ni-Co and Ni-Co-P.

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AD-257 135 Div. 17
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METHOD OF DETERMINING THE TENSILE STRENGTH OF METALS,
by G. V. Uzhik. 11 Jan 61. 21p. incl. illus. tables, 10 refs. (Trans. no. MCL-523 from Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk 10:1547-1560, 1948)
Unclassified report

DESCRIPTORS: *Metals, *Tensile properties, USSR, Test methods, Stresses, Steel, Elasticity, Plasticity, Deformation, Mechanical properties, Alloys.

The most important task in modern metallurgy in the field of improving the strength of metals consists in finding means for changing the strength (through the composition, heat treatment, etc.) that will not only insure at any moment of strain an increase in the absolute values of resistance to displacement and tear but also in the difference between them. Test methods are described which were used to determine the distribution of the axial stresses at the moment of tear in grooved tensile specimens of St-45 steel. Results indicate that the resistance to tear as a characteristic of the strength of metal in a given state, determinable by the proposed method, possibly will prove to be a constant of the material. Experiments showed that, with the increase of plastic strain under tensile or torsional stress, the resistance to tear can be considerably increased or decreased, depending on the condition of the metal. It increases with the lowering of the temperature of the tests and follows an increase in resistance to strain (limit of fluidity of St-45 steel) down to the temperature of -110 degrees.

AD-257 136 Div. 17
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF THE ADDITIVE DEFORMATION DIAGRAM AND CALCULATION OF THE ACTUAL RESISTANCES TO RUPTURE (Teoriya Diagrammy Additivnykh Deformatsiy i Vychisleniye Istinnogo Soprotivleniya Razrushen iyu),
by V. Ya. Shekhter. 11 Jan 61, 8p. incl. table (Trans. no. MCL-526 from Zavodskaya Laboratoriya 8:957-961, 1949)
Unclassified report

DESCRIPTORS: USSR, *Metals, *Alloys, Rupture, Deformation, Theory, Mathematical analysis, Tensile properties, Plasticity, Test methods, Test equipment, Mechanical properties.

AD-257 137 Div. 17
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FACTORY LABORATORY (SELECTED ARTICLES).
2 Nov 60, 21p. incl. illus. (Trans. no. MCL-528 from Zavodskaya Laboratoriya 23:949-953, 959-961, 1957)
Unclassified report

DESCRIPTORS: USSR, *Steel, *Fracture (Mechanics), Stresses, Deformation, Test methods, Brittle materials, Temperature, Tensile properties, Crystal structure, Photographic analysis, Microphotographs.

Contents:
Calculating the tendency of steel to brittleness under conditions of actual use, by Ye. M. Shevandin
Using the photometric method for studying steel fractures, by Z. N. Krasil'shochikov and Ye. N. Shvach

AD-257 138 Div. 17
(2 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON THE NATURE OF NECKS DURING THE ELONGATION OF SAMPLES,
by N. N. Davidenkov. 17 Jan 61, 7p. 13 refs. (Trans. no. MCL-529 from Zhurnal Tekhnicheskoy Fiziki 25:877-880, 1955)
Unclassified report

DESCRIPTORS: USSR, *Metals, *Steel, Tensile properties, Deformation, Hardening, Theory, Stresses, Mechanical properties, Test methods, Plastic flow, Plasticity, Elasticity.

The formation of a neck during the elongation of a tensile test specimen is discussed and an explanation of the phenomenon is presented. The conclusions of various authors are criticized.

AD-257 150 Div. 17
(2 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RECRYSTALLIZATION OF COLD DEFORMED TUNGSTEN (Rekristallizatsiya Kholodnodeformirovannogo Vol'frama),
by V. A. Lavrenko and I. Ye Shiyanovskaya. Oct 60. 4p. incl. illus. (Trans. no. MCL-604 from Metallovedeniye I. Termicheskaya Obrabotka Metallov (Periodical) 10:42-44, 1959)
Unclassified report

DESCRIPTORS: Powder metals, Microphotography, X-ray diffraction analysis, Hardening, Vacuum furnaces, Heat treatment, Tungsten, Crystallization, Deformation, USSR.

An investigation of the recrystallization of cold deformed W is described. Electronic microphotographs were made of undeformed and deformed test specimens. Hardness tests were made on deformed specimens subjected to various vacuum annealing temperatures from 800 to 1650 degrees. X-ray diffraction studies were made on undeformed, deformed, and annealed test pieces; the relation of the broadening of the spectral line (321) to the annealing temperature was established.

AD-257 153 Div. 17, 26
(2 June 61) OTS price $10.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HOT CRACKS IN THE WELDED JOINTS OF BILLETS AND CASTING (Goryachiye Treshchiny V Svarnykh Soyedineniyakh Slitkakh I Otlivkakh).
Oct 60, 120p. incl. illus. tables, 26 refs. (Trans. no. MCL-638 from Akademiya Nauk SSSR Institut Metallurgii, Moscowipp.51-67, 92-107, 108-130, 131-146, 147-161, 1959)
Unclassified report

DESCRIPTORS: Welded joints, Crystallization, *Castings, Steel castings, Aluminum alloys, Aluminum castings, *Fracture (Mechanics), Stresses, Deformation, Crystal structure, Steel, Metals, Heat resistant alloys, Determination, Tensile properties, *Welding, USSR, Mechanical properties.

CONTENTS:
Formation of hot tears in steel castings, by B. B. Gulyayev, I. I. Lupyrev, and L. M. Postnov
Hot cracks in welding chromium-nickel austenitic steels, by B. I. Medovar
Intercrystalline strength of metals, by N. N. Prokhorov
Intercrystalline crystallization cracks in casting and welding aluminum alloys, by S. V. Lashko-Avakyan and N. F. Lashko
A new technique of determining the tendency to hot-tear formation of the metal of welded seams, by G. L. Petrov

AD-257 157 Div. 17
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEW METALS IN MODERN ENGINEERING (Novi Metaly Suchasnoy I Tekhniky),
by L. I. Kadaner. Oct 60. 26p. (Trans. no. MCL-657 from Kiev, Derzhtekhvydav, USSR, pp. 3-18 and 32-41, 1958)
Unclassified report

DESCRIPTORS: USSR, *Metals, Metallurgy, Purification, Reactor fuels, Reactor moderators, Low temperature lubricants, Physical properties, Heat resistant alloys, Refractory materials, Alloys, Preparation, Processing, Production, Semiconductors.

The production of metals and alloys for applications in nucleonics, electronics, telemechanics, jet engineering and rocketry are discussed. Methods cited for the purification of metals include melting in vacuum or an inert atmosphere, production of metals from gaseous compounds, and zone melting. Metals for nucleonics include U, Pu, Th, Be, Li, Zr, and the rare-earth elements Sa, Gd, Tm, La, Pm, Ce, and Pr. The special properties, principal uses, and sources and methods of refining these metals are indicated. New structural metals and alloys developed for high-speed, high-temperature and high-pressure applications utilize Ti, Ta, Nb, Zr, and In. During the 5-yr period from 1948 to 1953 the production of Ti was increased by a factor of 1000.

AD-257 158 Div. 17
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RECENT TECHNICAL TRENDS IN POWDER METALLURGY (Nejnovejse Technicke Smery V Praskove Metallurgii),
by Curt Agte and Jiri Vacek. Oct 60, 17p. incl. tables (Trans. no. MCL-658 from Statni Nakladadtelstvi Technicke Literatury, pp. 7-13 and 68-81, 1955)
Unclassified report

DESCRIPTORS: USSR, *Powder metallurgy, Powder metals, Preparation, Processing, Rolling mills, Manufacturing methods, Sheets, Brittle materials, Extrusion, Mixtures, Sintering, Tungsten alloys, Cobalt alloys, Copper alloys, Powder alloys, Iron, Silver alloys, Molybdenum, Nickel alloys.

Contents:
Chemistry of mixtures
Preparation of powdered mixtures by pulverizing or grinding
Infiltration of the principal solid component by a solution containing the second component (or additional components) in the form of a metal salt
Preparation of hard metals
Manufacture of ASKO contacts (method S)
Infiltration of tungstic acid with additives preventing recrystallization (the electric lamp industry)
Direct rolling of powders
Description of the method
Manufacture of an iron sheet
Manufacture of sheets from ductile powders
Rolling of brittle powders (ASKO materials, and Friction materials)
Sheets with several layers or strips
Hot extrusion through a die

AD-257 166 Div. 17
(2 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A STUDY OF THE FATIGUE OF TOOL STEELS HAVING A SURFACE COATING,
by S. S. Kruglikov. 17 Jan 61. 5p. (Trans. no. MCL-790 from Ekspress-Informatsiya, Metallovedeniye i Termoobrabotka, Abstracts 61-68, No. 10, 4p, Mar 60)
Unclassified report

DESCRIPTORS: *Steel, *Fatigue (Mechanics), *Coatings, Metal coatings, USSR, Nickel plating, Aluminum coatings, Zinc coatings, Paints, Heat treatment, Nickel alloys, Zinc alloys, *Tool steel, Mechanical properties.

CONCLUSIONS: The fatigue strength of chrome tool steel is substantially reduced as a result of applying a metallic coating by spraying, dipping, or electrolysis. The decrease occurs before and after holding the steel at an elevated temperature. Shot-peening or nitriding the surface of steel prior to application of a coating considerably increases the fatigue strength of the coated specimens. This effect also occurs after holding the coated specimens at elevated temperatures. Aluminum-silicon paint does not substantially effect the fatigue of steel. (Author)

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AD-257 182 Div. 17, 25
(5 June 61) OTS price $4.60

Massachusetts Inst. of Tech., Cambridge, Mass.
STRUCTURES PRODUCED IN RAPIDLY SOLIDIFIED ALLOYS,
by Paul E. Brown and Clyde M. Adams, Jr. 1960, 20p. incl. illus. tables, 15 refs.
(Contract DA 19-020-ORD-4892)
(AROD-2344:2) Unclassified report

DESCRIPTORS: Metallurgy, *Castings, *Alloys, Freezing, Liquids, Solids, Transformations, Microstructure, Aluminum alloys, Copper alloys, Nickel alloys, Electric arcs, Melting, Deposits, Solutions, Solubility, Diffusion, Arc welds, Mechanical properties, *Phase studies, Crystal structure, Cooling.

An investigation was made of the dendritic structures formed during the solidification or freezing of relatively non-dilute engineering alloys. The form and dimensional character of the dentritic structure as influenced by the freezing rate and the properties of the cast structure were of principle interest. Arc deposits from consumable and non-consumable (W) electrodes with Al, Cu, and Ni alloys were used. Such deposits are castings of a sort and the conditions of freezing can be closely controlled. The dendrite spacings increased parabolically with the energy input. Interdendritic undercooling in the order of 0.1 F, in dilute alloys appeared to be a property of the solvent metal, did not vary significantly from one solute element to another, and was quite independent of the rate of solidification. The arc deposits froze much faster than chill castings and had smaller dendrite arm spacings than would be expected in any casting process. The minimum time for effective solution heat treatment of arc deposits, as reflected in final properties, depended on dendrite spacing (energy input). The dendrite arms in Al, Cu, and Ni alloys were generally parallel to the direction of heat flow.

AD-257 284 Div. 17, 25
(9 June 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
THE SINTERED COPPER POWDER (Spechennyi mednyi poroshok)
by Ye. M. Savitskiy and A. I. Vlasov. June 61, 8p. incl. illus. (Technical trans. no. F-64; Trans. from Tsvetnyye metally no. 7, pp. 72-77, 1960)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical trans. F-64.

DESCRIPTORS: *Powder metals, *Copper alloys, Powder alloys, Powder metallurgy, Aluminum compounds, Silicon compounds, Magnesium compounds, Oxides, Sintering, Crystal structure, Microstructure, Electrical properties, Resistance, Mechanical properties, Electrical conductance, Hardness, Processing, Mixtures, Hydrostatic pressure, Tensile properties, Oxidation, Extrusion, Heat resistant alloys, Crystallization.

A study was made of the structure, resistivity, oxidation resistance, mechanical properties, and manufacturing processes of sintered Cu powder when alumina, silica, or magnesia is added. With addition of Al203 powder to sintered Cu powder the strength is 50% and the hardness 100 to 200% higher than those of Cu at temperatures of 20 to 800 C; the recrystallization temperature is shifted from 300 C to 600 to 700 C. The electrical conductivity with 1 to 3% Al203 by volume is 87 to 93% that of Cu, while oxidation resistance is higher. The strength and hardness of the sintered product increase when very finely powdered Al203 is used. (Author)

AD-257 326 Div. 17, 25 U
(9 June 61) OTS price $1.60

Birmingham U. (Gt. Brit.).
THERMODYNAMICS OF ALLOYS VAPOUR PRESSURE STUDIES,
by A. T. Aldred and J. N. Pratt. Final technical rept. for 1 Oct 58-30 Apr 61. 30 Apr 61, 11p. incl. tables, 24 refs.
(Contract DA 91-508-EUC-362)
Unclassified report

DESCRIPTORS: *Alloys, *Vapor pressure, Lead alloys, Metals, Solids, Liquid metals, Measurement, *Thermodynamics, Bismuth, Bismuth alloys, Cadmium, Silver alloys, Thallium, Thallium alloys, Physical properties, Test methods, Heat of sublimation.

As part of a program of studies of the thermodynamic properties of alloy systems, measurements have been made of the vapor pressures of a number of pure metals and their alloys. The torsion-effusion technique has been employed and its applicability to alloy studies has been demonstrated. New vapor pressure measurements have been made on solid Cd (480 - 570 K), liquid Bi (820 - 1010 K) and liquid Th (780 - 920 K) and the results are assessed and compared with those of other workers. Bismuth vapor pressures have been measured over a wide range of liquid Ag-Bi alloys and the results used to compute the thermodynamic properties of the system at 1000 K. The rather unusual characteristics of these are discussed and it is suggested that they are attributable to the change of bonding and coordination of Bi on alloying. A similar evaluation of the thermodynamic properties of liquid Ag-Pb alloys is also presented and discussed. Preliminary measurements on solid and liquid Ag-Th alloys are described. (Author)

AD-257 331 Div. 17, 26
(9 June 61) OTS price $1.10

Illinois U., Urbana.
OBSERVATIONS ON THE GROWTH OF ALPHA-IRON SINGLE CRYSTALS BY HALOGEN REDUCTION,
by C. M. Wayman. 1959, 4p. illus. 11 refs.
(Contract AF 49(638)420)
(AFOSR-730) Unclassified report

DESCRIPTORS: *Iron, Iron compounds, Heat treatment, Chlorides, Hydrogen, Reduction, Processing, Production, *Single crystals, Growth, Metallurgy, Crystals.

By increasing the scale of the conventional technique for growing Fe whiskers, single crystals were produced of alpha-iron 1 to 2 mm in diameter and up to 80 mm in length. Reduction of

molten FeCl2 by H at 731 C was employed. Approximately 0.6 kg FeCl2.4H2O was used; to insure that all Cl was reduced and all HCl was removed from the system, the reaction time was 12 hrs. Most of the crystals grown according to this technique were considerably longer and thicker than those obtained by the use of a smaller amount of salt under the same operating conditions. Such crystals represent a reproducible source of high purity, single crystals of alpha-iron of reasonable experimental size, conveniently preoriented by growth.

AD-257 408 Div. 17, 26
(12 June 61) OTS price $2.00

Defense Metals Information Center, Columbus, Ohio.
SURVEY OF MATERIALS FOR HIGH-TEMPERATURE BEARING AND SLIDING APPLICATIONS,
by M. F. Amateau, D. W. Nicholson, and W. A. Glaeser. 12 May 61, 67p. incl. illus. tables, 118 refs. (DMIC memo. 106)
Unclassified report

DESCRIPTORS: Bearings, *Refractory materials, High temperature research, Metals, Alloys, *Ceramic materials, Mechanical properties, Physical properties, Chemical properties, Materials, *Cermets.

A few general classes of high-temperature materials have shown promise in actual bearings. For rolling-contact conditions, cemented carbides and cobalt-base superalloys appear promising to at least 1300 F. For sliding conditions, the selection of materials is wider, including nickel-base and cobalt-base superalloys, cemented carbides, some cermets, and a few pure ceramics. Most of these materials have some merit for use to 1500 F. For higher temperatures, refractory metals and their alloys have been considered but their poor oxidation resistance and sensitivity to embrittlement constitute serious drawbacks to their use. For temperatures above 2000 F, indications are that intermetallics, graphite, and some ceramics should be considered for potential bearing applications. Above 3000 F, graphite, at present, appears to be the only material suitable for sliding-contact applications. (Author)

AD-257 484 Div. 17, 1, 30
(12 June 61) OTS price $10.10

Southern Research Inst., Birmingham, Ala.
AN INVESTIGATION OF METHODS FOR DETERMINING THE CRACK-PROPAGATION RESISTANCE OF HIGH-STRENGTH ALLOYS,
by J. D. Morrison and J. R. Kattus. Summary technical rept. 14 Oct 59-14 Jan 61. 7 Mar 61, 110p. incl. illus. tables.
(Contract NOa(s) 60-6040-c)
Unclassified report

DESCRIPTORS: *Steel, *Stainless steel, Aluminum alloys, Hardening, Sheets, Heat treatment, Transition temperature, Stresses, Aging, *Fracture (Mechanics), *Tensile properties, Mechanical properties, Nickel alloys, Pressure vessels, Test methods, Determination.

Attempts were made to: (1) devise a simple crack-propagation specimen for evaluating high-strength sheet materials, (2) determine the crack-propagation characteristics of several high-strength sheet materials, (3) determine the effects of several experimental variables on the crack-propagation characteristics of some of these materials, and (4) determine the validity of the crack-propagation specimen for predicting the biaxial strength of the high-strength sheet materials. A sheet specimen called the shear-cracked specimen with a central transverse crack or notch produced by means of a simple punch-and-die fixture was devised. The crack-propagation properties obtained with the shear-cracked specimen were very similar to those obtained with fatigue-cracked specimens of the quench-hardenable and age-hardenable materials. The sheet-type crack-propagation specimen may be useful in predicting the biaxial strength of materials heat treated to very high strength levels (in excess of about 250,000 psi). At lower nominal strength levels, the crack-propagation specimen is apparently too severe a criterion. (Author)

AD-257 523 Div. 17, 4
(13 June 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
PRODUCING MOLYBDENUM ALLOYS BY KROLL REDUCTION AND EXTRUSION CONSOLIDATION,
by C. R. Lillie and Charles R. Simcoe. Bimonthly rept. for 18 Sep-17 Nov 59. 6 Jan 60. 6p. (Rept. no. ARF 2188-1)
(Contract NOa(s) 60-6019-c)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, Reduction, Production, *Extrusion, Chemical reactions, Metal sponges, Powder alloys.

This program has as its purpose the demonstration of the feasibility of the production of metallic molybdenum by the Kroll process, thus avoiding both the arc-melting and powder metallurgy methods of production with their shortcomings. More specifically, the feasibility of production of an alloy of molybdenum with 0.5% titanium is to be demonstrated, with the possibility of adding carbon as an ultimately necessary modification of the final alloy. (Author)

AD-257 524 Div. 17, 4
(13 June 61) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
PRODUCING MOLYBDENUM ALLOYS BY KROLL REDUCTION AND EXTRUSION CONSOLIDATION,
by C. R. Lillie and Charles R. Simcoe. Bimonthly rept. for 18 Nov 59-17 Jan 60. 10 Feb 60, 12p. incl. illus. (Rept. no. ARF 2188-2)
(Contract NOa(s) 60-6019-c)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, Processing, Reduction, *Extrusion, Production, Powder alloys, Chemical reactions.

The work performed in this period was an extension of that previously initiated: design and construction of a suitable Kroll reactor was pursued; the feasibility of preparing a solid feed for the reactor was investigated; and design and construction of equipment to be used in the consolidation of the reduced metal was carried on. (Author)

Division 18 - MILITARY SCIENCES AND OPERATIONS

AD-257 525 Div. 17, 4
(13 June 61) OTS price $1.60

Armour Research Foundation, Chicago, Ill.
PRODUCING MOLYBDENUM ALLOYS BY KROLL REDUCTION AND EXTRUSION CONSOLIDATION,
by C. R. Lillie and Charles R. Simcoe. Bimonthly rept. for 18 Jan-17 Mar 60, 15 Apr 60, 12p. incl. tables (Rept. no. ARF 2188-3)
(Contract NOa(s) 60-6019-c)
Unclassified report

DESCRIPTORS: *Molybdenum alloys, Reduction, *Extrusion, Chemical reactions, Power alloys, Processing, Production.

Work was continued on the construction of a reactor and appropriate extrusion facilities. All machining and assembly of components of the Kroll reactor has been completed. Final hookup of water, gas, electrical, and vacuum facilities is being completed. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-256 943 Div. 18
(5 June 61) OTS price $3.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
THE BAYVIEW GAS SCARE. A PROJECT SUMMIT REPORT,
by Peter T. Hesbacher and Louis Segaloff.
1 May 61, 26p. incl. illus. tables.
(Contract DA 18-064-cml-2733)
Unclassified report

DESCRIPTORS: *Civilian defense systems, Behavior, Chemical warfare agents, Toxicity, Poisonous gases, Attitudes, Effectiveness, Countermeasures, *Disasters.

A number of residents of a small southern town were accidentally exposed to a toxic gas. This incident provided Project Summit with an opportunity to study both individual and community responses to an unexpected exposure to a chemical agent. The study concentrated on the functioning of the community organizations, especially Civil Defense, under actual emergency conditions. A number of significant conclusions were evolved: (1) The situation was obscured and the confusion heightened by the lack of an easily recognizable event to focus attention on exactly what was happening; (2) Both individual and official communications tended to follow traditional channels, ignoring those formal channels which were at variance with traditional patterns; (3) In no case did a community agency have a specific plan for coping with gas exposure or a general disaster plan which would have been adaptable to this situation; (4) Most of the physical convergence activity involved official and semi-official assistance personnel and equipment; (5) Persons not immediately affected by the gas or involved in the recovery efforts were almost completely unconcerned; (6) The official investigation functioned mainly as a community catharsis; and (7) Conditions of the exposure closely duplicated a covert chemical attack; and there is a high probability that such an attack would have been disastrously effective. (Author)

AD-256 957 Div. 18, 26, 32
(5 June 61) OTS price $8.60

Rand Corp., Santa Monica, Calif.
DECISION RULES FOR THE DISPOSAL OF EXCESS AIR FORCE STOCK,
by J. W. Houghten and R. H. Holton. 1 Feb 61, 90p. incl. tables (Research memo. no. RM-2722)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Air force supplies, Disposal, *Air force equipment, Reasoning, Management engineering, Air force logistics, Costs.

In 1959 the Air Force disposed of surplus valued at over two and a half billion, not including aircraft. Part of the problem of carrying on an intelligent disposal function (one that originates in constantly changing technology and shifts in Air Force responsibilities and techniques) is the question of which items should be coded as excess and put up for disposal. The present study develops rules for doing this. It also considers similarities and differences between the disposal problems of the Air Force and private industry and considers the possible impact of surplus military items on the open market. The disposal rules arrived at in RM-2722 are presented in two steps. The first is a relatively simple review rule for screening possible items for disposal. The second is a more complete but necessarily more time-consuming decision rule for determining precisely how many units should be coded as excess. Application of the decision rules of RM-2722 should repay the Air Force by reducing the number and expense of judgmental errors that occur when some costs may not be taken into account; by putting stock disposal on a routine basis; and by easing explanations on the subject of surplus disposal procedures. (Author)

AD-257 109 Div. 18
(5 June 61) OTS price $16.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MODERN WAR TECHNOLOGY.
10 Oct 60, 254p. 31 refs. (Trans. no. MCL-110 from Sovremennaya Voennaya Tekhnika, Moscow, pp. 1-97, 108-133, 145-149, 157-211, 222-246, 263-268, 269-273, 1956)
Unclassified report

DESCRIPTORS: *Warfare, *Technological intelligence, *Nuclear warfare, *Nuclear weapons, *Guided missiles, Small arms, Artillery, Recoilless rifles, Jet planes, Helicopters, Tanks, Aircraft carriers, Radar, Television, Computers, Gas turbines, Titanium, Direction finding.

Contents: The following articles are presented: (1) atomic and hydrogen weapons; (2) means of application of the atomic weapon; (3) construction and means of application of guided missiles; (4) autonomously controlled missiles; (5) remotely controlled missiles; (6) guided aerial combat missiles; (7) self-guided missiles; (8) development of small arms; (9) development of artillery technique; (10) recoilless weapons; (11) progress of jet aviation; (12) helicopter aviation; (13) development of armor materiel; (14) contemporary foreign tanks; (15) aircraft carriers;

(16) protection of troops against atomic weapons; (17) ultrashort radio waves; (18) ground radar stations; (19) radiovision at sea; (20) aircraft radar stations; (21) aircraft radar interception stations; (22) new in radar; (23) instrument landing of aircraft; (24) automation in artillery; (25) general principles and possibilities of employing TV in military science; (26) television at the battle field; (27) technique of night vision; (28) infrared direction finders; (29) electronic computers; (30) gas turbines; and (31) titanium as a metal for modern engineering.

19. NAVIGATION

AD-257 102 Div. 19, 7
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RADIO (SELECTED ARTICLES).
16 Nov 60, 23p. (Trans. no. F-TS-9935 from Radio 12:pp. 30-33, 45-46, 1958)
Unclassified report

DESCRIPTORS: *Radio navigation, Navigation, Air position indicators, Glide path systems, *Radar navigation, Radar homing, Radio homing, *Air traffic control systems, Radio equipment, Radar equipment, Sextants, Ground controlled approach radar, Instrument flight, Instrument landing, Power supplies, *Fuel cells, Radio receivers, Hyperbolic navigation.

Contents:
Radio electronics in aircraft navigation
- Long-range navigation media
  - Panoramic aircraft radar
  - Dead reckoning instruments
  - Radio sextant
- Nonautonomous navigation media
  - Hyperbolic systems
  - Azimuth-and-range finding system
- Short-range navigation media
  - Landing of aircraft at the airport
  - Instrument-assisted landing of aircraft
  - Ground-controlled landing
  - Automatized system for control of air traffic and aircraft-landing guidance
  - Radar station for scanning the airport surface

Type VDZh-400 ferrocarbonic cells (air depolarization, iron plate, capacity 400 ampere/hour)
- Fundamental characteristics of the VDZh-400 cells

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-256 927 Div. 20
(5 June 61) OTS price $3.60

Diamond Ordnance Fuze Labs., Washington, D. C.
NEUTRON DOSIMETRY USING INELASTIC SCATTERING THRESHOLD DETECTORS,
by John S. Ingley. 16 Mar 61, 36p. incl. illus. tables (DOFL Rept. no. TR-905)
Unclassified report

DESCRIPTORS: *Neutron flux density, Barium, Measurement, Scattering, *Inelastic scattering, Radioactive isotopes, Nuclear isomers, Research reactors, Radioactive decay, Neutrons, *Neutron detectors.

By employing a new threshold detector that utilizes the inelastic scattering reaction to the isomeric state of Ba-137, the time-integrated neutron flux above 1.9 mev was measured in the General Atomic Triga reactor. The values compare favorably with those extrapolated from measurements of the flux above 2.9 mev given by the standard sulfur pellet method, and evidence thus far indicates that the new method may provide a whole new series of threshold detectors. (Author)

AD-256 953 Div. 20
(5 June 61) OTS price $15.00

Radiation Effects Information Center, Columbus, Ohio.
SURVEY OF IRRADIATION FACILITIES,
by Mary Jane Oestmann. 28 Feb 61, 214p. (REIC rept. no. 16; Supersedes REIC rept. no. 7, AD-157 174, Add. no. 1 to REIC rept. no. 7, AD-210 767, and REIC rept. no. 11, AD-237 794)
(Contract AF 33(616)7375, Continuation of Contract AF 33(616)6564, Proj. 4458)
Unclassified report

DESCRIPTORS: *Research reactors, Sources, *Gamma rays, *Fast neutrons, Radiobiology, Test reactors, Radiochemistry.

Irradiation facilities generally available to the Air Force and its contractors are surveyed. Reactors operated at steady-state and pulsed conditions and gamma facilities are included. Wherever possible, the information is tabulated. (Author)

AD-257 083 Div. 20, 2, 25
(5 June 61) OTS price $1.10

Observatoire de Paris-Meudon (France).
NEW AFTERGLOW EMISSION ASSOCIATED WITH NITROGEN METASTABLE ATOMS,
by L. Herman. 1961, 7p. incl. illus. (Technical note no. 5)
(Contract AF 61(052)88)
(AFCRL-410)
Unclassified report

DESCRIPTORS: *Recombination reactions, Excitation, Discharge tubes, Nitrogen, Atoms, Gas discharges, *Atomic spectrum, Forbidden transitions, Diffusion, Sky brightness, Zodiacal light.

Division 20 - NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-257 116 Div. 20, 1
(5 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
BETA-PROCESSES AND ASTROPHYSICS (Beta-Protsessy I Astrofizika)
by D. A. Frank-Kamenetskiy. 18 Oct 60, 32p. incl. illus. 34 refs. (Trans. no. MCL-317 from Uspekhi Fizicheskikh Nauk 58:415-432, 1956)
Unclassified report

DESCRIPTORS: *Astrophysics, *Stars, Protons, Beta particles, Positrons, Neutrinos, *Nuclear reactions, *Beta particle reactions, Probability, Sun, Energy.

AD-257 118 Div. 20, 17
(5 June 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE EFFECT OF IRRADIATION ON THE STRUCTURE AND PROPERTIES OF STRUCTURAL METALS (Vliyaniye Oblucheniya Na Strukturu I Svoystva Konstruktsionnykh Metallov),
by S. T. Kishkin. 21 Oct 60, 88p. incl. illus. tables (Trans. no. MCL-356 from Gosudarstvennoye Izdatel'stvo Oboronnoy Promyshlennosti, Moscow, 1958)
Unclassified report

DESCRIPTORS: USSR, *Metals, *Alloys, *Radiation damage, Mechanical properties, Electron bombardment, Physical properties, Hardness, Crystal structure, Lattices, Electrical properties, Elasticity, Phase transitions, Electrical conductance, Neutron bombardment, Alpha particles.

Contents: The basic changes in the structure of metals during irradiation; the probability of transition from the solid state to a liquid state during irradiation; irradiation and the nature of the electric conductivity change; irradiation and the changes in the mechanical properties; metastability of a metal and the reduction of atomic bond energy during irradiation; irradiation and the modulus of elasticity; general diagram of changes in mechanical properties of metal during irradiation; irradiation and yield point of different metals; irradiation, initial resistance to shear and cold brittleness of copper and steel; irradiation, tensile resistance of molybdenum, and physical nature of cold brittleness; irradiation and mechanical properties of metals and alloys; and irradiation and properties of metals at high temperatures.

AD-257 141 Div. 20, 22
(2 June 60) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THERMONUCLEAR WEAPONS (Termoyadernoye Oruzhiye),
by M. B. Neyman and K. M. Sadilenko. Oct 60, 48p. incl. illus. tables (Trans. no. MCL-553 from Voennoye Izdatel'stvo Ministerstva Oborony Soiuza SSR. Moskva, pp. 29-38, 58-72, 83-89, 142-156, 1958)
Unclassified report

DESCRIPTORS: *Thermonuclear reactions, *Nuclear explosions, Tritium, Deuterium, Lithium, Detection, USSR, *Atomic bomb explosions, *Nuclear weapons.

Contents:
Atomic weapons
Thermonuclear weapons
Tritium
Deuterium
Lithium
Detection of atomic and thermonuclear explosions

AD-257 145 Div. 20, 4, 26
(2 June 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
UTILIZATION OF ATOMIC ENERGY IN THE PETROLEUM INDUSTRY (Ispol'zovaniye Atomnoy Energii V Neftyanoy Promyshlennosti),
by Yu. S. Zaslavskiy and G. I. Shor. Oct 60, 17p. incl. illus. (Trans. no. MCL-581 from Gosudarstvennoe Nauchno-Tekhnicheskoe Izdatel'stvo Neftyanoi I Gorno-Toplivnoi Literatury, Moskva:46-52, 1956)
Unclassified report

DESCRIPTORS: *Atomic energy, Labeled substances, Petroleum, *Petroleum industry, *Refineries, Radioactive isotopes, Processing, USSR, Gamma rays.

The utilization of nuclear radiation in oil refining is discussed. The following phases are considered: (1) the use of radioactive radiation for the establishment of new technological processes of refining of petroleum and petroleum products or the improvement of existing processes; (2) the application of radioactive isotopes for the control and automation of plant processes of oil refining; and (3) the application of radioactive isotopes as labeled atoms in research.

AD-257 146 Div. 20, 4
(2 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ISOTOPES AND RADIATIONS IN CHEMISTRY (Izotopy I Izlucheniya V Khimii),
Oct 60, 33p. incl. illus. tables (Trans no. MCL-582 from Izdatel'Stvo Akademii Nauk SSSR, Moskva:85-105, 1958)
Unclassified report

DESCRIPTORS: *Polymers, *Polymerization, Benzenes, Ethylenes, Styrenes, *Radiochemistry, Photochemistry, Hydrocarbons, Organic compounds, Radioactive isotopes, Radiation damage, Decomposition, Copolymerization, Oxidation, Chlorination, Chemical reactions, USSR.

Chemical processes, such as polymerization, chlorination, and oxidation of organic compounds, achieved through nuclear radiation are discussed. Owing to the large size of the polymer molecules, fundamental changes in their properties can be induced by relatively small amounts of energy; such changes would be difficult or impossible by the conventional chemical methods. Available data indicates the possibility of accomplishing such processes by utilizing a considerable part of the main energy of atomic transformations, i.e., the kinetic energy of the fission fragments.

AD-257 147 Div. 20, 4
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROSPECTS OF THE REALIZATION OF RADIATION CHEMICAL PROCESSES IN THE CHEMICAL INDUSTRY (Perspertivy Osushchestvleniya Radiatsionno-Khimicheskikh Protsessov v Khimicheskoy Promyshlennosti),
by M. A. Proskurnin. Oct 60, 20p. incl. table, 29 refs. (Trans. no. MCL-586 from Khimicheskaya Promyshlennost' 2:7-14, 1959)
Unclassified report

DESCRIPTORS: *Radiochemistry, USSR, Fission products, Radioactive isotopes, *Chemical industry, Nuclear energy, Chemical reactions, Polymerization, Vulcanization, Oxidation, Decomposition, Synthesis, Organic compounds, Radiation damage.

A discussion is presented on those action features of radiation which make them different from the action of other agents and which are of interest to chemical technology. Some of the processes initiated by radiation include: (1) polymerization of ethylene in gas-phase and in organic solvents; (2) emulsion and bulk polymerization of styrene; (3) vulcanization of tire casings; (4) vulcanization of polyethylene; (5) oxidation of benzene; (6) chain oxidation of benzene; (7) oxidation of ethylene and nitrogen; (8) decomposition of CO2; and (9) many reactions of organic synthesis.

AD-257 159 Div. 20, 25
(2 June 61) OTS price $13.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELEMENTARY PARTICLES (Elementarnye Chastitsy),
by Yu V. Novozhilov. Dec 60, 186p. incl. illus. tables (Trans. no. MCL-660 from Gosudarstvennoye Izdatel'stvo Fiziko-Matematicheskoy Literatury, Moskva, 1959)
Unclassified report

DESCRIPTORS: *Nuclear physics, *Textbooks, USSR, *Particles, Mesons, Pions, Protons, Nuclear reactions, Nuclear moments, Nuclear spins.

Contents:
Preface
Introduction-What is an elementary particle
On the brink of the world of elementary particles
First steps in the world of elementary particles
Particles necessary for the explanation of nuclear forte
First results
Strange particles
Achievements of recent years
Conclusions

AD-257 196 Div. 20, 8, 25, 30
(7 June 61) OTS price $2.60

International Business Machines Corp., Owego, N. Y.
STUDY OF EFFECT OF HIGH-INTENSITY PULSED NUCLEAR RADIATION ON ELECTRONIC PARTS AND MATERIALS,
by F. A. Foss. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 21p. incl. illus. tables, (IBM no. 61-521-3)
(Contract DA 36-039-sc-85395, Proj. DA 3G 93-01-001-01)
Unclassified report

DESCRIPTORS: Test reactors, *Radiation damage, Tests, *Electronic equipment, Radioactivity, Nuclear explosions, *Ferrite cores, *Memory devices, Ferrites, Computers, Test methods, *Test facilities, Magnesium compounds, Manganese compounds, Copper compounds, Chromium compounds, Nickel compounds, Zinc compounds.

The proposed core radiation tests to be conducted at the Sandia Pulsed Reactor Facility (SPRF) in May 1961 are described. The pulse response of ferrite and tape wound cores used for memory and logic applications will be observed during irradiation. The Sandia Pulsed Reactor (SPR) will be used as the radiation source. (Author)

AD-257 346 Div. 20, 2, 4
(8 June 61) OTS price $8.10

Geophysics Corp. of America, Bedford, Mass.
ATOMIC TRANSITION PROBABILITIES FOR UPPER ATMOSPHERE PHENOMENA,
by A. M. Naqvi. Apr 61, 80p. incl. illus. tables. (GCA Technical rept. 61-21-A; Scientific rept. no. 6)
(Contract AF 19(604)7405)
(AFCRL 305)
Unclassified report

DESCRIPTORS: *Upper atmosphere, *Atomic energy levels, Atomic structure, Mathematical analysis, Probability, Tables, Chemical reactions, Chemical equilibrium, Absorption, Photoemission.

The theory for the calculation of atomic transition probabilities is reviewed. Various useful formulae are given. The experimental and theoretical values by different authors are compared and listed for a number of transitions in hydrogen, lithium, nitrogen, oxygen (I and II), sodium, potassium, rubidium, and cesium. For several transitions for which previous experimental or theoretical results did not exist, values were obtained using the Coulomb approximation method of Bates and Damgaard (Phil. Trans. Roy. Soc. (London) A242, 101 (1949)). Probabilities of electric quadrupole and magnetic dipole transitions in NI, NII, OI and OII were also tabulated. (Author)

AD-257 376 Div. 20, 8
(12 June 61) OTS price $1.10

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
INVESTIGATION OF X-RADIATION HAZARD FROM AN/APS-20E RADAR.
13 Nov 59, 4p. (Rept. no. MA-1.1-8970)
(Proj. no. ADC AV-34040.1)
Unclassified report

DESCRIPTORS: *Radiation hazards, *Radar, Radiation instruments, *Microwaves, *X-rays, Measurement, Hazards, Radar equipment, Electronic equipment.

Division 21 - NUCLEAR PROPULSION
Division 22 - ORDNANCE

AD-257 490 Div. 20, 30
(14 June 61) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A STUDY OF THE DOSIMETRIC PROPERTIES OF LOW DENSITY POLYETHYLENE,
by Joe A. Swisher and Arthur D. Coates. Mar 61, 24p. incl. illus. table, 16 refs. (BRL memo. rept. no. 1336)
(Proj. 512-10-001)
Unclassified report

DESCRIPTORS: *Dosimeters, Plastics, Test equipment, Crystal structure, Gamma counters, Polymerization, Polymers, Infrared spectroscopy, Chemical bonds, Radiation counters, Chemical reactions, Tensile properties, Mechanical properties, Physical properties, Chemical properties, Oxidation, Sensitivity, *Ethylenes, Radiation damage, Gamma rays.

Polyethylene samples were exposed to a relatively small (approximately 8.7 curies) cesium-137 gamma source for varying durationr of time. The chemical oxidation was measured by infrared absorption techniques, and the physical changes by measurements of elongation and tensile strength. All changes were a direct result of the quantity of radiation received. The results indicate that polyethylene has significant potentiality as a wide range gamma dosimetry material. The polymeric dosimeter has proven to be reasonably accurate in the exposure range of 1 x 10 to the 6th power to 5 x 10 to the 7th power roentgens. (Author)

AD-257 563 Div. 20, 25
(13 June 61) OTS price $3.60

Michigan U., Ann Arbor.
NEUTRON TRANSPORT WITH ANISOTROPIC SCATTERING,
by Janusz R. Mika. May 61, 36p.
(Sponsored by the Office of Naval Research)
Unclassified report

DESCRIPTORS: *Nuclear reactions, Neutrons, *Neutron scattering, Scattering, Particles, *Diffusion, Polynomials, Mathematical analysis, Geometry, Integral equations, Functions, *Transport properties, Fission.

The general procedure of solving the one-velocity Boltzmann equation in the case of plane geometry is presented. It is assumed that the scattering function can be expanded into the finite series of Legendre polynomials. The complete set of eigenfunctions of the Boltzmann equation is found. The orthogonality and completeness of the eigenfunctions are proved. By way of illustration, solutions of some basic problems of neutron diffusion are given. (Author)

21. NUCLEAR PROPULSION

AD-257 373 Div. 21, 1, 20
(12 June 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
HEALTH PHYSICS FOR ANP.
4 Feb 59, 10p. incl. tables (Rept. no. MA-5-881)
(Proj. TED no. ADC AE-5207)
Unclassified report

DESCRIPTORS: Aircraft, Safety, Design, *Radiation hazards, *Nuclear propulsion.

22. ORDNANCE

AD-256 910 Div. 22
(2 June 61) OTS price $2.60

Albion Malleable Iron Co., Mich.
WARHEAD FOR ROCKET, BOOSTED, 115mm, HE, XM-54.
Progress rept. no. 12, 1-28 Feb 61. 10 Mar 61, 1v. incl. tables.
(Contract DA 20-018-501-ORD-272)
Unclassified report

DESCRIPTORS: *Rockets, Warheads, Boosters, *Rocket heads, *High explosive ammunition, Production, Iron castings.

AD-256 917 Div. 22
(5 June 61) OTS price $7.60

Aberdeen Proving Ground, Md.
PRELIMINARY ENGINEERING TESTS OF T114 BAT VEHICLE SYSTEM (WEAPON DISPERSION),
by J. S. Zitz. May 61, 1v. incl. illus. tables.
(Rept. no. DPS-218)
Unclassified report

DESCRIPTORS: *Self-propelled guns, Tests, *Tracked vehicles, *Recoilless rifles, *Antitank guns, Armored vehicles, Interior ballistics, Gun mounts, Automatic weapons, Effectiveness.

The initial test program was set up to be fired in four phases as follows: (1) comparison firings between two M40A1 BAT systems; (2) comparison firings between the T114 ground mount and the control M40A1; (3) comparison firing between the T114 weapon and pod assembly and control M40A1; (4) comparison firing between turret and pod subassembly and the control M40A1. The purpose of these firings was to demonstrate that no degradation in accuracy performance of the 106-mm rifle would result from adaptation to the T114 vehicle. Due to mechanical and electrical difficulty with the pod subassembly, the fourth phase was fired statically from the pod without cycling the weapon. Data compiled from this test indicate the 106-mm rifle and cal .50 spotting rifle suffer no degradation in accuracy performance when adapted to the T114 vehicle. (Author)

AD-256 918 Div. 22
(5 June 61) OTS price $5.60

Aberdeen Proving Ground, Md.
INVESTIGATION OF PREMATURE OCCURRENCE WITH CAVITATED COMPOSITION B SHELL, HE, 120-mm, T15E3,
by Ben Callis. May 61, 1v. incl. illus. tables
(Rept. no. DPS-220)
Unclassified report

DESCRIPTORS: *Projectiles, *Shaped charges, TNT, RDX, Cavitation, Separation, Hazards, High explosive ammunition, Detonation, Sensitivity, Tests, Specifications.

The purpose of this test was to determine if premature occurrences could be caused by 10 + or - 5% cavitation or 5/64-inch base separation of the Composition B bursting charge. All rounds were temperature-conditioned at + 140 F for 24 hours prior to testing. Four rounds prematurely functioned low-order in the gun tube. Two of the rounds had cavitation within the bursting charge, and two had base separations of the bursting charge. All shell were assembled with a dummy fuze, and none contained live tracers. It is concluded that cavitation and/or base separation of the bursting charge can cause premature functioning of the Comp B explosive filler. It is recommended that Shell, HE, T15E3, Comp B loaded, be considered unsafe to fire if the filler contains cavitations or base separations of the magnitude investigated in this test. (Author)

AD-256 919 Div. 22
(5 June 61) OTS price $3.60

Aberdeen Proving Ground, Md.
TEST OF BLANK-FIRING ATTACHMENTS FOR THE 7.62-mm M14 RIFLE AND M60 MACHINE GUN,
by Frank Hines, Jr. May 61, 1v. incl. illus. tables (Rept. no. DPS-234)
Unclassified report

DESCRIPTORS: *Automatic weapons, Terminal ballistics, *Small arms, Effectiveness, *Gun barrel attachments, Tests, Guns.

Four each of the XM12 blank-firing attachments (BFA's) for the M14 rifle, and MX13 for the M60 machine gun were furnished for this test. Weapon-functioning tests and extreme-temperature tests were conducted with each BFA-weapon combination using Cartridge, Blank 7.62-mm, XM82. In addition, one round of Cartridge, Ball, 7.62-mm, M80 was fired in an M14 rifle with the XM12 BFA in position to determine if the resulting fragments would endanger a rifleman. It was determined that the experimental BFA's (XM12 and XM13) would satisfactorily operate the weapons for which they are intended (with the XM82 blank cartridge) at ambient temperatures above 0 F. At lower temperatures, operation of the BFA-weapon-cartridge system was marginal to unsatisfactory. Serviceable life of both types of BFA's was influenced by the relative severity of the firing schedules employed. The distribution pattern of the fragments produced by firing an M80 round through an XM12 BFA indicated that the rifleman would not have been endangered in this instance. However, the BFA and flash suppressor were rendered unserviceable and the rifle barrel suffered a slight bend at the muzzle (approximately 0.008 inch). (Author)

AD-256 949 Div. 22, 31
(5 June 61) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
DESIGN TECHNIQUES TO REDUCE THE HAZARD OF INADVERTENT FIRING IN ELECTROEXPLOSIVE DEVICES BY ELECTROMAGNETIC ENERGY,
by Russell N. Skeeters. 1 Mar 61, 12p. 15 refs.
(Rept. no. NOTS TP 2629)
Unclassified report

DESCRIPTORS: Radiation hazards, *Hazards, Electromagnetic waves, Propellants, Explosives, Explosive actuators, *Ordnance, *Safety, Electric igniters, Reduction, Electrical networks, Electromagnetic fields, Radio fields, Naval ordnance, Design, Shipborne, Firing circuits.

Accidental firings of electroexplosive devices can result from electrical sources such as static discharges, sneak currents, and currents generated by thermoelectric action, galvanic action, and electromagnetic induction. Military propellants, explosives, and explosive devices use electrical initiation almost exclusively and hence are subject to inadvertent actuation by spurious electrical currents. It is incumbent upon designers of ordnance to inform themselves of these potentialities and to incorporate into the designs of weapons and weapon systems measures for protection against such accidents. Methods devised or proposed for alleviation of electromagnetic hazards are discussed, and suggestions are made for the incorporation of preventive measures in the initial design of weapon systems. (Author)

AD-256 981 Div. 22, 2, 5, 30
(5 June 61) OTS price $1.10

Upper Air Lab., U. of Colorado, Boulder.
AIR FORCE ROCKET INSTRUMENTATION,
by Fred Wilshusen. Final rept. 1961, 7p.
(Contract AF 19(604)5559)
(AFCRL-448)
Unclassified report

DESCRIPTORS: *Meteorological instruments, *Telemeter systems, *Sounding rockets, *Instrumentation, Telemetering, Meteorology, Air Force.

AD-257 031 Div. 22
(8 June 61) OTS price $2.60

Johnson Fare Box Co., Chicago, Ill.
CHARGER, ELECTRIC, M-73 WEAPON HELICOPTER TURRET INSTALLATION. PANEL CONTROL,
by Harvey B. Gunn. Progress rept. no. 7 (Final) 1 Feb-31 Mar 61. 12 Apr 61, 16p. illus.
(Contract DA 11-022-504-ORD-3418)
Unclassified report

DESCRIPTORS: *Gun-cycling devices, *Automatic weapons, *Helicopters, Electrical equipment, Gun turrets, *Airplane turrets, Firing panels, Tests, Aircraft guns, Armament.

Research was concerned with the development of an electric charger capable of performing certain operations and giving certain operating signals on a four M-73 weapon installation in a helicopter. A rack-and-gear mechanism was devised to retract the gun's barrel extension, and an intermittent duty motor was selected to operate the unit. Firing tests were made on the charger with satisfactory results.

Division 22 - ORDNANCE

AD-257 069 Div. 22
(6 June 61) OTS price $4.60

Naval Ordnance Test Station, China Lake, Calif.
THE EFFECTIVENESS OF CLUSTER WEAPONS AGAINST SQUARE AREA TARGETS,
by Eldon L. Dunn. 30 Mar 61, 46p. incl. illus.
(Rept. no. NOTS TP 2655)
(NAVWEPS rept. no. 7641) Unclassified report

DESCRIPTORS: *Bomb clusters, Bombs, Targets, *Ammunition damage, Effectiveness, Theory, Scattering, Mathematical analysis, Warheads, *Antipersonnel ammunition, *Scatter bombing, Surface targets, Antipersonnel weapons, Area bombing.

The results of a parametric study on the effectiveness of cluster weapons against area targets, where an area target consists of a large number of units distributed over an area (e.g., a battalion of troops in the field) are presented. The effects of number of bomblets, delivery error, ammunition dispersion, and warhead effectiveness are considered. The results of the study are presented in handbook form so that one may quickly determine the effectiveness of any proposed cluster weapon, once specific values have been assigned to the above parameters. (Author)

AD-257 092 Div. 22, 30
(6 June 61) OTS price $7.60

Frankford Arsenal, Philadelphia, Pa.
STANDARDS FOR BALLISTIC DATA HANDLING SYSTEMS,
by M. Mondress. May 61, 72p. incl. illus. 17 refs.
(Memo. rept. no. M61-27-1)
Unclassified report

DESCRIPTORS: *Standards, *Data processing systems, Catapults, Recoilless rifles, Transducers, Calibration, Measurement, *Instrumentation, *Explosive actuators, Electrical properties, Tests, Analog systems, Analog-to-digital converters, Errors, Test methods, *Ballistics, *Data, Piezoelectric crystals, Strain gages, Transformers, Piezoelectric gages, Recording systems, Digital systems.

The electrical instrumentation and techniques used in the performance testing of propellant actuated devices and similar ballistic devices are presented. The report discusses basic operating principles, sources of error and methods of calibration of data acquisition and data reduction equipment. The determination of total system error and the filtering of data signals are considered in some detail. (Author)

AD-257 189 Div. 22, 3
(7 June 61) OTS price $36.10

Picatinny Arsenal, Dover, N. J.
ENCYCLOPEDIA OF EXPLOSIVES AND RELATED ITEMS. VOLUME I,
by Basil T. Fedoroff, Henry A. Aaronson and others. 1960, 1v. incl. illus. tables (Rept. no. PATR 2700)
Unclassified report

DESCRIPTORS: *Explosives, *Encyclopedias, *Propellants, *Pyrotechnics, Projectiles, Ammunition, Ordnance, Weapons, Materials, Military chemicals, Scientific personnel, Munitions, Munitions industry, Phosphorus compounds, Industrial production.

The first volume (A to Azoxy) of an encyclopedia of explosives and related items is presented. The encyclopedia is intended to cover: (1) military, industrial, and other explosives; explosive compositions; propellants; and pyrotechnic compositions; (2) analytical procedures for the more common explosives, propellants, and pyrotechnic compositions; (3) compounds which deflagrate or may possibly explode because of the presence of phosphoric groups; (4) ammunition items, such as projectiles, bombs, grenades, detonators, fuzes; (5) calibers of weapons and projectiles used in the US and foreign countries; (6) brief definitions of ordnance terms; and (7) names of scientists who have made important contributions in the fields of explosives, ammunition, and weapons. This volume contains sections on physical tests used to determine explosive properties; abbreviations, code names, and symbols; descriptive text of encyclopedic items; tables concerning US, British, and German Sieve series; and calibers of US and foreign ammunition; and an index of subjects as alternate names of items.

AD-257 289 Div. 22, 7
(9 June 61) OTS price $3.60

Jansky and Bailey, Inc., Alexandria, Va.
INVESTIGATION OF ELECTROMAGNETIC HAZARDS TO ORDNANCE AT THE U.S. NAVAL WEAPONS LABORATORY, DAHLGREN, VIRGINIA,
by Martin M. Abromavage. 30 May 61, 37p. incl. illus. tables (Technical rept. no. 5454)
(Contract N178-7604)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, Tests, Electromagnetic shielding, Radiation damage, Hazards, Ordnance, Measurement, *Firing circuits, Analysis, Electromagnetic fields, Naval ordnance, Explosive actuators, Radiation hazards, Intensity.

An explanation is given of procedures used in the measurement and analysis of electromagnetic energy inadvertently delivered to electroexplosive devices tested at the Naval Weapons Laboratory, Dahlgren, Virginia. The hazards of electromagnetic radiation to ordnance devices are associated with the radiated power transmitted from antennas, environmental field strength magnitudes, RF voltage picked up by exposed firing cables, the RF impedance of the firing circuit, and the terminating impedance of the circuit. It was concluded that a possibly hazardous condition existed in the CAD area at the Naval Weapons Laboratory. (Author)

AD-257 557 Div. 22
(13 June 61) OTS price $9.10

Lake City Arsenal, Independence, Mo.
INVESTIGATION OF THE BALLISTIC AND CHEMICAL STABILITY OF 20mm AMMUNITION LOADED WITH VARIOUS PROPELLANTS,
by W. P. Taylor. Apr 61, 1v. incl. illus. tables.
(IED rept. no. 61-8)
(Proj. no. 58-32)
Unclassified report

DESCRIPTORS: *Propellants, *Powders, Ammunition, Projectiles, Nitroglycerine, Nitrocellulose, Storage, Stability, Ballistics, Velocity, Chemistry, Combustion, Nitroso radicals, Chemical reactions, Decomposition, Amines, Pressure, *Propellant grains, Deterioration, Heat, Temperature, Tests, Test methods, Guns, *Small arms ammunition.

A determination was made of the effect of long term storage at elevated temperature on the ballistic and chemical stability of WC ball propellants and DuPont cool burning propellants. Ammunition loaded with these propellants and M52A3B1 primers was placed in both normal and high temperature storage. Samples were withdrawn at 8-wk intervals over a period of 66 wk for chemical analysis and ballistic testing under a variety of conditions. The results indicated that of the 5 propellants tested, the IMR exhibited the greatest stability both ballistically and chemically. The cooler burning DuPont CR7516 exhibited higher average pressure levels and longer action times than the other propellants under test, but its performance otherwise was comparable to that of the other propellants. (Author)

AD-257 558 Div. 22
(13 June 61) OTS price $3.60

Lake City Arsenal, Independence, Mo.
STUDY OF HEAVY PELLET M52A3B1 ELECTRIC PRIMERS,
by W. P. Taylor. June 61, 1v. incl. illus. tables (IED rept. no. 61-9)
(Proj. OAC 56-184 and 56-184-I-1)
Unclassified report

DESCRIPTORS: *Electric primers, *Pellets, *Cartridges, Test methods, Tests, Velocity, Pressure, Propellants, Aircraft ammunition, *Primers, Electric guns, Aircraft guns, Automatic weapons.

A test program was conducted to determine what effect heavy weight pellets in M52A3B1 electric primers would have on the pressure level of 20mm M55 Ball ammunition loaded with WC 870 ball propellant. The normal pellet weight selected was 2.75 gr. and the heavy pellet weight was 3.00 gr. No significant difference in pressure levels was observed for the pellet weight difference considered. (Author)

AD-257 579 Div. 22, 17
(16 June 61) OTS price $1.60

Aberdeen Proving Ground, Md.
FIELD SERVICE TEST OF EXPERIMENTAL PRECISION-CAST SPROCKETS,
by John F. Crox, Jr. June 61, 10p. incl. illus. tables (Rept. no. DPS-253)
(Proj. 548-03-001)
Unclassified report

DESCRIPTORS: *Tanks, *Drive sprockets, Steel, Steel castings, Casting, *Cast steel, *Tracked vehicles, Tests, Test methods, Reliability.

Two experimental precision-cast sprockets were constructed of composition FS1075 steel and were identical in geometric design to the standard Ordnance items now in use. The precision-cast sprockets were operated a total of 2550 miles on an M48A2 tank and were compared with a set of standard sprockets operated on the opposite side of the same tank. The test sprockets operated successfully and in a more satisfactory manner than the standard sprockets. There was less wear with the experimental sprockets than with the standard. (Author)

23. PERSONNEL AND TRAINING

AD-257 088 Div. 23
(7 June 61) OTS price $1.60

Bureau of Naval Personnel, Washington, D. C.
STANDARDIZATION OF THE ADVANCED TECHNICIANS TEST,
by John J. LaGaipa. Feb 61, 11p. incl. tables (Technical bull. no. 61-6)
Unclassified report

DESCRIPTORS: Tests, Standardization, *Naval personnel, *Achievement tests, Selection.

The Advanced Technicians Test consists of four tests that will form a part of the Career Test Battery for use as the principal personnel testing battery for enlisted men in their second enlistment and beyond. These are Reading Comprehension, Mathematics, Physics and Electricity. This report deals with the standardization of these tests. (Author)

AD-257 089 Div. 23, 5
(7 June 61) OTS price $5.60

Bureau of Naval Personnel, Washington, D. C.
POST-TRAINING LOSS OF RADIOMAN SKILLS,
by Albert S. Glickman and L. Harold Sharp. Mar 61, 1v. incl. illus. tables (Technical bull. no. 61-7)
Unclassified report

DESCRIPTORS: *Radio operators, Naval personnel, Effectiveness, Training.

A survey of graduates of Radioman Class A Schools showed considerable differences in continuous wave (CW) receiving proficiency associated with differences in the amount and kind of CW practice obtained since leaving School. Subjects were all the enlisted men who had graduated from Class A School during the year ending 30 June 1959, and on 3 August 1959 were assigned to ships and shore stations in the Mediterranean area. All of this group completed an experience record form, which revealed that after one year out of school about half of the graduates had not yet been assigned to a regular watch to receive CW. All of the group who were aboard ships were administered a test of CW receiving ability. Half were not able to receive at the level approximating the Class A School graduation requirement, and about two-thirds could not receive at the level required for advancement to RM3. Implications for training practices are discussed. (Author)

Division 24 - PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES
Division 25 - PHYSICS

AD-257 274 Div. 23, 16
(9 June 61) OTS price $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
ELECTROENCEPHALOGRAPHIC FINDINGS IN RELATION TO EPISODES OF ALTERED CONSCIOUSNESS IN AVIATORS,
by Harlow W. Ades. 14 Feb 61, 24p. incl. illus. tables (Rept. no. 3)
(Proj. MR005.13-3001)

Unclassified report

DESCRIPTORS: Aviation personnel, Naval personnel, *Pilots, Selection, *Electroencephalography, Epilepsy, Blackout (Physiology), *Aviation accidents, Countermeasures, Vertigo, Safety, *Aviation medicine.

Electroencephalograms taken on pilots with a history of accidents or of unconscious episodes in flight were compared with those on a Control Group of 1375 aviation candidates. Certain EEG features were found to be much more commonly recurrent in the incident-accident groups than in the Control Group. Implications of these findings are discussed with respect to possible use of EEG as a selective device for aviators and with respect to the relationship between apparent cerebral instability and other physiologically unfavorable factors whose coincidence may trigger an unconscious episode. Recommendations for further investigation and baseline EEG recordings are made. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-257 073 Div. 24
(5 June 61) OTS price $3.60

Reconnaissance Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
AERIAL PHOTOGRAPHIC RECONNAISSANCE UNDER ADVERSE ILLUMINATION CONDITIONS,
by F. L. Dunscombe. Rept. on Aerial Photographic Reconnaissance Technology. Jan 61, 24p. incl. illus.
(WADD TN 60-294) Unclassified report

DESCRIPTORS: *Aerial photography, Aerial reconnaissance, *Illumination, Photographic film, Photographic filters, Haze, Precipitation, Snow, Twilight, Aerial photographs, *Climatic factors, Flight testing.

Flight tests were conducted to study the effects of adverse conditions on aerial reconnaissance photographs taken with standard Air Force equipment. Four kinds of aerial film were tested, and photographs were taken at varying altitudes in haze, rain and snow, and twilight. Good quality photographs were made in rain when slant visibility was less than one mile and the light level was 400 foot candles (10 percent of the average for noon of a bright sunny day). One kind of film exposed 25 minutes after sunset produced interpretable prints. The photographic results of the flight tests and illumination boundary limits for the different films are presented. Recommended future research to extend the effectiveness of existing equipment is outlined. (Author)

AD-257 359 Div. 24
(12 June 61) OTS price $2.60

Aeronautical Photographic Experimental Lab., Naval Air Material Center, Philadelphia, Pa.
INVESTIGATION OF CURRENT TECHNIQUES OF LOW ALTITUDE PYROTECHNIC FLASH NIGHT AERIAL RECONNAISSANCE PHOTOGRAPHY.
by Robert W. Tafel. Phase rept. 15 July 60, 21p. incl. illus.
(Proj. TED no. ADC-PH-4581; Rept. no. NADC-AP-6012)

Unclassified report

DESCRIPTORS: *Aerial reconnaissance, *Night photography, *Pyrotechnic ejectors, Illumination, Aerial cameras, Aerial photography, Aerial photographs, Projectile trajectories, Mathematical analysis, Illuminating projectiles, Flight testing.

This analysis traces the development of the pyrotechnic flash night photographic system with special emphasis on its application and use in Naval reconnaissance aircraft. A program of mathematical analysis is described which includes the development of a graphical method of presenting the operational limits of the night photographic system. A correlation is made between flight test data and mathematical data which reveals that the widely accepted value of .09 foot-candle-seconds for minimum scene illumination is unrealistically low and that .135 f.c.s. is a more practical value. The advantages of upward cartridge ejection are fully substantiated. (Author)

25. PHYSICS

AD-256 909 Div. 25, 14
(2 June 61) OTS price $2.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
TRANSIENT THERMAL BEHAVIOR OF DECOMPOSING MATERIALS. PART I. GENERAL THEORY AND APPLICATION TO CONVECTIVE HEATING,
by Thomas R. Munson and Robert J. Spindler. 3 May 61, 25p. incl. illus. table, 12 refs.
(Technical rept. no. RAD-TR-61-10; Thermodynamics Analysis Section rept. no. 674)
(Contracts AF 04(647)258 and AF 04(647)305, Proj. nos. WS 133A and 107A-2)

Unclassified report

DESCRIPTORS: *Materials, Decomposition, Temperature, *Pyrolysis, Mathematical analysis, Theory, *Heat transfer, Convection, Heating, Polymers, Fluorides, Ethylenes, *Plastics, Analog computers, Aerodynamic heating, Re-entry aerodynamics, Simulation, *Ablation, Differential equations, Thermal radiation, Thermodynamics.

A mathematical model is presented for the transient behavior of materials which undergo thermal decomposition. The general model accounts for a rate-controlled decomposition as well as internal heat transfer by conduction, convection, and radiation. The behavior of the model under conditions of convective heating is examined by means of analog simulation. Results of this simulation for a charring material and for Teflon are presented and the results on Teflon compared with experimental data. (Author)

AD-256 950 Div. 25, 2, 30
(5 June 61) OTS price $2.60

Observatoire de Paris-Meudon (France).
EXPERIMENTAL STUDY OF THE INFLUENCE OF THE MEAN ELECTRON ENERGY ON THE COMPOSITION OF THE N2 SPECTRUM IN THE LABORATORY AND THE AURORAS,
by L. Herman. 1961, 1v. incl. illus. tables.
(Technical Scientific note no. 3)
(Contract AF 61(052)88)
(AFCRL-409) Unclassified report

DESCRIPTORS: *Electrons, Energy, Plasma physics, Ionization, Nitrogen, Neon, Electrical properties, *Aurorae, *Spectrographic analysis, Pressure, Gases, Photometers, Discharge tubes, Infrared radiation, Intensity, Molecules, Measurement, Excitation.

An extensive study was made of the relations which exist between the spectral composition of the emission and the electrical characteristics in a partially ionized plasma. The first gases studied were pure molecular nitrogen and nitrogen mixed with neon. Measurements were made of the change of the apparent temperature of vibration as a function of pressure, and the potential drop in the positive column. Also obtained were some preliminary data concerning the changing ratios of the intensities in the first and second positive systems of N2 as a function of the average electron energy. The experimental results seem to confirm the interpretation given in a preceding paper on the origin of the intensity changes of the above systems in the spectrum of polar auroras. (Author)

AD-256 951 Div. 25, 4, 20
(5 June 61) OTS price $2.60

Observatoire de Paris-Meudon (France).
PREDISSOCIATION BY ROTATION OF THE OH MOLECULE,
by L. Herman. 1961, 17p. incl. illus. tables,
(Technical note no. 2)
(Contract AF 61(052)88)
(AFCRL TN 60-482) Unclassified report

DESCRIPTORS: *Hydroxides, *Molecules, *Dissociation, *Molecular rotation, Nuclear energy levels, Electron transitions, Nuclear states, Spectrographic analysis, *Molecular spectroscopy, Hyperfine structure, Deuterated compounds, Excitation.

The rotational analysis of the B $^2\Sigma^-$ A $^2\Sigma$ system of the OH molecule shows a predissociation of the upper B $^2\Sigma$ state in one normal hydrogen atom and one excited O(^{1}S) atom. The effective potential curves for this state are calculated and allowed to check the predissociation assumption. The O(^{1}S) atoms give in the OH and OD spectra small continuous quasi-molecular spectra. Moreover, in the OH spectrum one observes near the (OI) 5577 line, a set of isolated lines also ascribed to complex molecules. The rotational structure of the above system for the OD molecule is given in tables. Complementary experimental data are given for the C $^2\Sigma^-$ A $^2\Sigma$ system of OH. (Author)

AD-256 958 Div. 25, 4
(5 June 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
BIBLIOGRAPHY ON DIFFUSION OF IMPURITY ELEMENTS IN COMPOUND SEMICONDUCTORS,
by G. L. Pearson. 7 Apr 61, 8p. incl. tables
(Technical rept. no. 1801-1)
(Contract DA 04-200-ORD-1087, Projs. TB 2-0002 and 59901007)
Unclassified report

DESCRIPTORS: *Bibliography, *Semiconductors, *Diffusion, Impurities, Indium compounds, Solids, Aluminum compounds, Phosphorus, Gallium compounds, Arsenic, Antimony.

A study of the literature pertaining to solid state diffusion in compound semiconductors has been made as a preliminary step to a research project in this area. The resulting bibliography is given in the hope that it may be useful to other workers interested in this subject. While no claim is made that the listings are exhaustive, it is believed that the more important publications are included. This is a relatively new field of research with many interesting problems in need of solution. (Author)

AD-256 969 Div. 25, 3
(5 June 61) OTS price $2.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
BRIGHT AND DARK RINGS,
by Rudolf B. Penndorf. Scientific rept. no. 4 on Research on Aerosol Scattering in the Infrared. Mar 61, 26p. incl. tables (Rept. no. RAD-TR-61-16)
(Contract AF 19(604)5743)
(AFCRL-425) Unclassified report

DESCRIPTORS: Particles, Aerosols, *Optics, Physical properties, Refractive index, Refraction, *Light, Optical analysis, Scattering.

The scattering diagrams of spherical aerosols possess maxima and minima, which can be interpreted as sequences of bright and dark rings. These rings are investigated for eta equals 1.10, 1.20, 1.30, 1.33, 1.40, 1.44, and 1.50. The results show a systematic behavior exists for the appearance of these rings, such as the number of rings and their regular shift in angular position as function of the size parameter, alpha. For the intensity function i1, the rings due to diffraction move with increasing size parameter into the forward scattering area, whereas those caused by refraction and reflection within the sphere stay in the backward scattering area. The rings appear first in the backward area as long as the size parameter is small, but from rho exceeds 4 (rho equals normalized size parameter) on they begin to appear at 80 to 90 degrees; i.e., in the right-angle scattering area. For the intensity function i2, however, the systematic behavior is poor and ill-defined. Nevertheless, some of the basic features are similar to those for i1. Finally, a system similar to i1 exists for the angular Mie scattering coefficient i sub theta. In the last case, data are given for eta equals 1.33 only. (Author)

Division 25 - PHYSICS

AD-256 982 Div. 25
(5 June 61) OTS price $1.60

California U., Los Angeles.
ON THE STABILITY ANALYSIS OF AN IMPLICIT DIFFERENCE ANALOG OF THE TWO-DIMENSIONAL DIFFUSION EQUATION WITH CONCENTRATION DEPENDENT DIFFUSIVITY,
by Bertram Bussell. Mar 61, 14p. incl. illus. tables (Rept. no. 61-13)
(Contract Nonr-23352)
Unclassified report

DESCRIPTORS: *Diffusion, *Diffusion theory, *Thermodynamics, Partial differential equations, Stability, *Heat transfer, Nonlinear systems, Numerical analysis, Special functions, Series, Numerical methods and procedures.

A procedure has been demonstrated by which variations in the diffusion coefficient in a two dimensional diffusion equation can be introduced into the solution at every time step in the alternating direction method of solution. This can be accomplished provided that the change in the dimensionless parameter (analogous to the inverse of the Fourier modulus in heat transfer) falls within specified ranges as indicated, or that an adjustment in the time step can be made to compensate for a portion of the change in the diffusion coefficient so that the allowable bounds on the change are not violated. The conditions as developed for this problem using the von Neumann criterion are sufficient to insure stability of the difference analog. (Author)

AD-256 983 Div. 25, 6, 12, 18, 20
(6 June 61) OTS price $44.00

Convair, San Diego, Calif.
(No title).
Scientific rept. no. 2 on Contract AF 19(604) 5554 and Scientific rept. no. 1 on Contract DA 04-495-ORD-1660, 31 Dec 59, 1v. incl. illus. tables (Rept. no. ZPh-050)
(Contracts AF 19(604)5554 and DA 04-495-ORD-1660)
Unclassified report

DESCRIPTORS: Ultraviolet detectors, Wake, Infrared detectors, Gas ionization, *Physics, *Antiaircraft defense systems, *Guided missiles, *Detection, Exhaust gases, Launching, Rocket motors, Infrared radiation, Ionosphere, Plasma physics, Microwaves, Radar signals, Radar images, Chemical reactions, Reaction kinetics, Inelastic scattering, Shock waves, High temperature research, Fluid flow, Magnetohydrodynamics, Satellite vehicles, Resonance scattering, Plasma jets, Space charges, Re-entry vehicles, Re-entry aerodynamics, Ablation, Thermodynamics, Exosphere.

Contents:
Launch phase radiation physics research
Midcourse physics research
  Interactions of a body with the ionosphere
  Particle-surface interaction phenomena
  Vacuum phase radiation
Re-entry physics research
  Flow field studies
  High-temperature air with additives
  Ablation research
  Shock physics
  Electron scattering cross section research

AD-257 021 Div. 25, 8, 30
(5 June 61) OTS price $4.60

Kiruna Geophysical Observatory (Sweden).
SPECTROPHOTOMETRIC STUDIES OF AURORA,
by Georg Gustafsson. Technical summary rept., 1 July 59-31 Dec 60. 20 Jan 61, 25p. illus. tables.
(Contract AF 61(052)288)
Unclassified report

DESCRIPTORS: *Photometers, *Auroras, Signal to noise ratio, *Spectrophotometers, Light, Instrumentation, Brightness, Measurement, *Spectrographic analysis.

The photometer and its most important properties are described. The signal-to-noise ratio of the photometer is given in detail. Absolute measurements of arcs and rays are analyzed. Measurements have been made on rapid variations of the aurora up to a frequency of 20 kc. The possibility of using pulse techniques for measuring spacial velocities is discussed. (Author)

AD-257 023 Div. 25
(6 June 61) OTS price $8.10

Institute of Air Flight Structures, Columbia U., New York.
VIBRATIONS OF PLATES OF NONHOMOGENEOUS VISCOELASTIC MATERIAL,
by J. M. McCormick, Jr. May 61. 74p. illus. 19 refs. (Technical rept. no. 11)
(Contract Nonr-26634, Proj. NR 064-417)
Unclassified report

DESCRIPTORS: Viscosity, *Elasticity, Vibration, Theory, Mathematical analysis, Equations, Materials.

Methods are considered for the vibration analysis of plates of linear viscoelastic materials when the properties vary through the thickness of the plate. In Part I the three-dimensional equations for harmonic vibrations are formulated. Examination of these differential equations indicates that they are only in rare cases tractable. In Part II the transient problem is considered. By using a warping function, equations are derived which are generalizations of the Timoshenko-Mindlin equations for homogeneous materials. It is found that the generalized equations may have a much narrower range of validity than the equations for homogeneous materials, the restrictions depending on the manner in which the properties vary. The restrictions occur also for elastic materials with variable properties. (Author)

AD-257 026 Div. 25, 8
(6 June 61) OTS price $6.60

Electronics Research Lab., U. of Calif., Berkeley.
A STUDY OF CIRCUIT-INDEPENDENT OSCILLATIONS IN A GASEOUS CONDUCTOR,
by B. E. Dobratz. 15 Feb 61, 59p. incl. illus. 29 refs. (Scientific rept. no. 12; Series no. 60, Issue no. 344)
(Contract AF 19(604)2270)
(AFCRL-68) Unclassified report

DESCRIPTORS: Plasma physics, *Plasma oscillations, Oscillation, Electromagnetic waves, Radiofrequency, Electrical properties, Discharge tubes, Gases, Conductors, *Radio waves, *Propagation.

In gaseous-plasma conductors an unusual type of circuit-independent, time-periodic, low-frequency oscillations of current and voltage can be produced under certain conditions. The effect is usually more pronounced at low currents and voltages near the threshold of conduction. A magnetic field is not necessary. The frequency generated is typically in the range of 1 kc to 1 Mc. The waveform may be sinusoidal or nonsinusoidal. Oscillations probably related to the type considered here are reported sporadically in the literature. The phenomenon was studied under controlled conditions. Oscillation amplitude and frequency were studied as functions of gas pressure, current, circuit capacitance and resistance, magnetic-field strength, and cathode temperature. A study of volt-ampere characteristics was made. The three classical explanations of oscillatory phenomena in gaseous conductors, (1) RC negative-resistance or circuit-controlled oscillations, (2) potential-minimum oscillations, and (3) ordinary plasma oscillations of space charge are analyzed and compared with experimental data obtained under controlled conditions. The phenomena observed appear to be definitely not related to (1) and probably not to (2) or (3). (Author)

AD-257 064 Div. 25, 12, 14
(5 June 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STRESS CONCENTRATIONS IN FILAMENTARY STRUCTURES, by John M. Hedgepeth. May 61, 30p. incl. illus. tables (Rept. no. TN-D-882)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-882.

DESCRIPTORS: *Fibers, Glass textiles, Filaments, Resins, *Reinforcing materials, *Stresses, Deformation, Elasticity, *Sheets, Rocket cases, Guided missiles, Load distribution, Structural shells, Mathematical analysis, Filament wound construction, Laminates, Failure (Mechanics).

Theoretical analyses are made of the stress distributions in a sheet of parallel filaments which carry normal loads and are imbedded in a matrix which carries only shear. In all cases, uniform loading at infinity is assumed and small-deflection elasticity theory is used. Static and dynamic stress-concentration factors due to one or more filaments being broken are determined. Particular attention is paid the dynamic overshoot resulting when the filaments are suddenly broken. The dynamic-response factor increases from 1.15 to 1.27 as the number of broken filaments is increased from one to infinity. A somewhat lower dynamic-response factor is obtained when a hole is suddenly caused in the filament sheet. (Author)

AD-257 072 Div. 25
(5 June 61) OTS price $2.60

Western Reserve U., Cleveland, Ohio.
ENHANCED PHOTOCONDUCTANCE AND SHADOWS ON CADMIUM SULFIDE SINGLE CRYSTALS.
Technical rept., Sep 59-Sep 60. 1 May 61, 22p. incl. illus. 17 refs.
(Contract DA 33-019-ORD-3098)
(AROD rept. no. 2172:2) Unclassified report

DESCRIPTORS: *Photoconductivity, *Single crystals, *Semiconductors, Electric fields, Electrical conductance, Cadmium compounds, Sulfides, Density, Energy, Surface properties, Crystals, Electrons.

It is well known that a capacitive electric field applied normally to the surface of many semiconductors produces an observable effect on the conductivity of the semiconductor. The effects on the resistance of such a capacitive field are expected to vary directly with the square of the resistivity of the material. The discrepancy between the observed and expected change in conductance arising from an applied field is used to study the density and energies of the surface states on semiconductors. (Author)

AD-257 078 Div. 25
(7 June 61) OTS price $3.60

Stanford Research Inst., Menlo Park, Calif.
THE ANALYSIS OF RING SPACE TRUSSES AS CIRCULAR RINGS,
by Hans J. Dahlke, Jan 61, 27p. incl. illus. tables, 13 refs. (Scientific rept. no. 1)
(Contract AF 19(604)5912)
(AFCRL 72) Unclassified report

DESCRIPTORS: *Rings, Beams, *Parabolic antennas, Design, Mathematical analysis, Differential equations, Load distribution, Deformation, Deflection, Moments, Antennas, Stresses, Structures.

A ring type space truss which may be used in large-diameter parabolic antennas is analyzed as a ring of uniform cross section on two supports located at opposite points of a diameter. By properly choosing the flexural and torsional rigidity, i.e., the resistance of the beam to deformation by loads causing bending and twisting moments, the internal stress resultants and the deflection of the original truss may be analyzed by means of this uniform ring. Two loading systems are considered: a uniform load along the circumference of the ring and two equal concentrated loads at midspan between the supports. Expressions for the stress resultants, M and T, the bending and twisting moments, respectively, are derived for each of the two loading cases, the uniform load and the concentrated loads. A relationship for the maximum deflection of the ring is developed. It represents the total maximum deflection due to the two loading cases combined. Finally, a relation for the deflection at any section of the ring is derived. (Author)

AD-257 081 Div. 25, 2
(5 June 61) OTS price $1.60

Oslo U. (Norway).
AN INVESTIGATION OF THE STATE OF POLARIZATION OF THE RED AND GREEN O-LINES IN POLAR AURORAE, by Ove Harang. 1960. 10p. incl. illus. (Scientific rept. no. 1(7))
(Contract AF 61(052)252)
(AFCRL TN 60-488) Unclassified report

DESCRIPTORS: *Aurorae, *Spectrographic analysis, Polarization, *Electromagnetic waves, Light, *Colors, Electric dipole transition, Nuclear magnetic moments, Electrons, Atoms, Oxygen, Geophysics.

The state of polarization of the lines 6300 and 5577 angstroms in polar aurorae is investigated. It is shown that during favourable conditions it is possible to decide that the difference in amount of vertical and horizontal linear polarization must be less than 1%. It is also shown that no circular polarization appears when viewed in the direction toward magnetic zenith. The conclusion is that the red and green lines emitted from polar aurora of considerable strength show no polarization. (Author)

AD-257 082 Div. 25, 2
(5 June 61) OTS price $2.60

Observatoire de Paris-Meudon (France).
EMISSION SPECTRUM OF A HIGH FREQUENCY DISCHARGE IN OXYGEN,
by L. Herman. 1961, 21p. incl. illus. tables
(Technical note no. 1)
(Contract AF 61(052)88)
(AFCRL TN 60-480) Unclassified report

DESCRIPTORS: *Oxygen, *Atmosphere, *Upper atmosphere, Aurorae, Spectrographic analysis, Infrared spectroscopy, Atomic spectrum, Ultraviolet spectroscopy, Atomic energy levels, *Molecular spectroscopy, Excitation, Gas flow, Gas discharges, Voltage, Theory, Test methods, Dissociation.

In a high frequency discharge through flowing oxygen at atmospheric pressure, it was possible, with high dispersing spectrographs, to extend the vibrational and rotational analysis of the Schumann-Runge bands ($B\,^3\Sigma - X\,^3\Sigma$ system) up to 5 700 Å. A predissociation at $v' = 3$ and 4 was observed; the $v' = 4$ level is strongly predissociated. It seems that there is no predissociation at $v' = 5$. In the same discharge we observe some new atmospheric bands. Each of the $\Delta v = +1$ and $\Delta v = 0$ sequences have five bands. A suggestion is made that the excitation of the atmospheric bands is due to an interaction between the $X\,^3\Sigma$ and $b\,^1\Sigma$ states, enhanced at high pressure. (Author)

AD-257 086 Div. 25
(5 June 61) OTS price $4.60

Metals Research Lab., Brown U., Providence, R. I.
ULTRASONIC ATTENUATION AND VELOCITY MEASUREMENTS IN QUARTZ,
by Thomas Fitzgerald and Rohn Truell. Technical note, 4 May 61, 30p. illus. 18 refs.
(Grant No. DA-ORD-38 and NSF-G14313)
(AROD rept. no. 2302:5) Unclassified report

DESCRIPTORS: *Quartz crystals, Quartz, *Ultrasonic radiation, Ultrasonics, Attenuation, Temperature, Velocity, *Sound transmission, Phonons, Crystals, Lattices, Vibration, Absorption, Heat transfer, Theory, Solids, Solid state physics, Frequency, Sound, Damping, Measurement.

The frequency dependence of the attenuation of compressional waves in X-cut quartz obeys an approximate square law consistant with the dislocation damping theory which predicts a square-law frequency dependence up to a resonant frequency. The behavior of the attenuation as a function of temperature below 100 K is in agreement with that predicted by a phonon-phonon process. Above 40 K the thermal conductivity varies approximately as 1/T while the specific heat increases linearly with the temperature between 40 and 150 K. The temperature dependence of the velocity measured in this experiment indicates that it remains constant at a value of 5.75 X 10 to the 6th power cm/sec to within + or - 0.02%. In the region where the attenuation is rapidly changing there is apparently no associated velocity change.

AD-257 097 Div. 25, 17, 26
(5 June 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A RAPID METHOD OF CRYSTAL GROWTH AND EVALUATION OF THERMOELECTRIC COMPOUND SEMICONDUCTORS,
by V. J. King. Technical rept. on Physical Electronics. May 61, 22p. incl. illus. (Rept. no. LMSD-325511)
Unclassified report

DESCRIPTORS: *Semiconductors, Thermoelectricity, *Crystals, Growth, Tests, *Single crystals, Materials, Machining, Soldering alloys, Melting, Measurement, Test equipment, Temperature, Analysis, Laboratory furnaces, Design, Intermetallic compounds, Alloys, Cleaning, Electrodes.

Concurrent to providing material to the research and device groups of the Solid State organization during the past two years, a facility was developed which has the ability to produce, process, and evaluate compound semicohductor materials with a minimum expenditure of effort. The maximum value of this facility will probably be realized by intensified application to material problems, which require evaluation of large numbers of materials of diversified and unknown behavior. Future work in the crystal laboratory is to be directed to the preparation and study of semiconductors of the multi-element compound and solid solution type, particularly for the purpose of locating more efficient thermoelectric materials. Specifically, the intentions are to extend the hand flame and associated techniques and the special thermal analysis method to establish the stoichiometry and behavior of the ternary compounds. (Author)

AD-257 098 Div. 25, 2
(5 June 61) OTS price $3.60

Liege U. (Belgium).
THEORETICAL CONSIDERATIONS ON THE PREDICTED FAR ULTRAVIOLET SPECTRA OF COMETS AND OF POLAR AURORAE,
by P. Swings, D. Bosman-Crespin and C. Arpigny. Rept. on Research on Relations Between Cometary and Upper Atmospheric Physics. 15 Aug 60. 36p. incl. illus. tables. (Technical note no. 7)
(Contract AF 61(052)24)
(AFCRL TN 60-825) Unclassified report

DESCRIPTORS: *Comets, *Aurorae, *Ultraviolet radiation, Ultraviolet spectroscopy, Upper atmosphere, Spectrographic analysis, Electromagnetic waves, Space flight.

The expected far ultraviolet spectra of comets and of polar aurorae is considered. The far ultraviolet spectrum of comets will be weak compared to the visual region; new molecules may be found. In the case of absorption bands shortward of lambda 1500 the excited molecular emissions may be discrete resonance series, on which the radial velocity effect will be very important. It is likely that unexpected results will be found, as it is impossible to predict certain phenomena, as in the case of H2. The predicted far ultraviolet spectrum of aurorae may help in preparing the experiments, and especially in disentangling readily the essential features of the spectrograms from satellites or rockets, as soon as such material will be recorded. Great uncertainties are obviously involved in such predictions, especially as far as the intensities are concerned. (Author)

AD-257 124 Div. 25, 20, 30
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DIAGNOSIS OF PLASMA (Diagnostika Plazmy),
by S. Lukyanov. 24 Oct 60, 28p. incl. illus. (Trans. no. MCL-386 from Znaniye - Sila 6:32-36, June 59)
Unclassified report

DESCRIPTORS: *Plasma physics, Nuclear reactions, *Nuclear physics, Hydrogen, Atoms, Heat, Measurement, Thermometers, Temperature, Astrophysics, Thermonuclear experiments, *Thermonuclear reactions, Density, Pressure.

AD-257 163 Div. 25, 17
(2 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MEASURES OF THERMODYNAMIC VALUES BY MASS SPECTROMETER, STUDY OF SULFUR AND ZINC,
by R. Colin. 21 Dec 60, 37p. incl. illus. tables, 35 refs. (Trans. no. MCL-743 from Measures de Grandeurs Thermodynamiques par Spectrometry de Masse Etude de Sulfur de Zinc: pp. 31, Sep 59)
Unclassified report

DESCRIPTORS: *Thermodynamics, Measurement, Mass spectrometers, *Sulfur, Zinc compounds, *Zinc, *Vaporization, Solid state physics, Intermetallic compounds, Sulfides, Pressure, Dissociation, Decomposition, France.

A study was made of the vaporization of ZnS in a completely open cell. The following thermodynamic relationships were measured: (1) relation between the vapor tension and the ionic intensity; (2) relation between the decomposition vapor tensions at equilibrium and the measured partial pressure; (3) relation between the decomposition vapor tensions and the apparent vapor tension of ZnS; and (4) relation between the decomposition vapor tensions and the thermodynamic magnitudes. The coefficients of evaporation of Zn and S2 from ZnS were very close to unity. The energy of dissociation of the gaseous ZnS molecule was less than or equal to 47 kcal/mole.

AD-257 185 Div. 25
(6 June 61) OTS price $6.60

Radiation Lab., U. of Michigan, Ann Arbor.
THEORY OF PLASMAS, II. LINEAR OSCILLATIONS IN RELATIVISTIC PLASMAS,
by K. Imre. Final rept. Feb 61. 56p. incl. illus. 16 refs. (Rept. no. 2756-1-F)
(Contract AF 33(616)5585)
(ARL-TR-60-274, Pt. 2) Unclassified report

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, Mathematical analysis, Equations, Magnetohydromagnetics, Magnetic fields, *Propagation, Theory, Series, *Plasma oscillations, Perturbation theory.

The linear oscillations in a hot plasma which is representable by the relativistic Vlasov equation with the self-consistent fields are investigated. The method which is used by Bernstein in the nonrelativistic case is generalized to obtain the formal solution of the linearized problem. Particular attention is given to the case when the unperturbed distribution function is of the Maxwell-Boltzmann-Juttner type (i.e., the relativistic equilibrium distribution) in which case the integrations involving the velocity space are carried out explicitly. The dispersion equation is derived and studied to some extent, considering the spatial dispersions explicitly in some special cases of interest. The ordinary and extraordinary modes, and the magnetohydrodynamic waves are investigated when the propagation vector is along the unperturbed magnetic field. The asymptotic expansions are developed corresponding to the dispersion relations of the cases considered, and they are shown to be in agreement with the results of previous studies in their respective order of approximations. It is found that circularly polarized transverse waves propagating along the unperturbed magnetic field are evanescent nu squared exceeds the quantity 1-phi squared divided by omega squared where nu is the index of refraction (kc/omega) and phi is the gyrofrequency. (Author)

AD-257 186 Div. 25, 6, 15
(6 June 61) OTS price $9.10

Radiation Lab., U. of Michigan, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS. XLV. STUDIES IN NON-LINEAR MODELING. - II,
by J. E. Belyea, J. W. Crispin, Jr. and others. Final rept. 31 Dec 60. 1v. incl. illus. (Rept. no. 2871-6-F)
(Contract AF 19(604)4993)
(AFCRL-40) Unclassified report

DESCRIPTORS: *Non-linear differential equations, Non-linear systems, *Partial differential equations, *Plasma physics, *Electromagnetic theory, Electromagnetic waves, Scattering, Electromagnetic fields, *Radar echo areas, Spheres, Cylindrical bodies, Theory, Mathematical analysis.

The application of non-linear modeling to Maxwell's equations and to the Navier-Stokes equation was investigated to obtain an understanding of the phenomena of the interaction of electromagnetic energy with plasmas. A discussion of the generality of non-linear modeling is presented which displays that all second order ordinary differential equations arising from a

conservative system can be locally modeled in a non-linear manner. Also included is a discussion of the problem of modeling the scalar wave equation in n-dimensions and a preliminary consideration of the effect of experimental errors on the applicability of non-linear modeling. The problem of modeling a scalar scattering problem for one geometric configuration into a scalar scattering problem for a second geometric configuration was begun. Two cases were considered; (1) that of modeling a scalar scattering problem for an elliptical cylinder by one for a circular cylinder, and (2) that of modeling prolate spheroid problems into sphere problems. (Author)

AD-257 188 Div. 25, 20
(7 June 61) OTS price $3.60

Minerals Research Lab., U. of Calif., Berkeley.
THE EFFECT OF PLASTIC DEFORMATION ON SELF - DIFFUSION IN NICKEL,
by A. R. Wazzan, J. Mote, and J. E. Dorn.
18 Apr 61. 30p. incl. illus. 18 refs. (Technical rept. no. 3; Series no. 114, Issue no. 3)
(Contract AF 49(638)58)
Unclassified report

DESCRIPTORS: *Single crystals, *Nickel, *Diffusion, Plasticity, Deformation, Tracer studies, Temperature, Isotopes, Radioactive isotopes, Metallic crystals, Electron transitions, Electroplating, Electroplated materials, Stresses.

The coefficient of self-diffusion in nickel single crystals in the unstrained state was found to be a function of temperature. The coefficient of self-diffusion of Ni single crystals undergoing plastic deformation (tensile) was measured for strain rates ranging from 0.0085 to 0.055/hr at 948 + or - 1.5 K and 1021 + or - 1.5 K. It was found that the coefficient of self-diffusion increased with an increase in strain rate at a constant temperature and decreased with an increase in temperature at constant strain rate. These results are discussed in terms of a model which assumes that vacancies are produced by two mechanisms, namely, the motion of jogged screw dislocations and the thermally activated climb of edge dislocations and that vacancies anneal by migrating to fixed sinks, namely, dislocation lines. The analysis indicates that the motion of jogged screws may be an unimportant source for vacancies at these temperatures and strain rates. (Author)

AD-257 195 Div. 25, 17
(7 June 61) OTS price $1.60

Rutgers U., New Brunswick, N. J.
EFFECTS OF PLASTIC DEFORMATION ON SUPERCONDUCTIVE PROPERTIES OF METALS,
by Bernard Serin. Quarterly rept. no. 3, 1 Jan-31 Mar 61, 31 Mar 61. 13p. incl. illus.
(Contract DA 36-039-sc-85187)
Unclassified report

DESCRIPTORS: Metals, Deformation, Plasticity, *Aluminum, *Superconductivity, *Transition temperature, Fatigue (Mechanics), Electron transitions, Stresses, Resistance, Foils, Electrical properties, Heat treatment, Tensile properties, Aluminum alloys, Sheets, Lattices.

An investigation was made of the effects of dislocations on the superconductive transition temperature of Al. The dislocations were put into the specimens by cold work, fatigue, and tensile stress. Isochronal annealing studies were made of cold rolled Al specimens. Results show that the changes in transition temperature (T sub C) and residual resistance produced by deformation are little changed between 0 to 200 C, partially anneal out rapidly in the range 200 to 300 C, and the anneal to completion more slowly in the range 300 to 600 C. This result makes it unambiguously clear that the effects can be ascribed only to dislocations. Preliminary measurements on specimens deformed by fatigue have indicated that the transition temperature may be increased slightly. Specimens deformed in tension by 1% and 2% showed no change in T sub C. (Author)

AD-257 296 Div. 25, 8
(8 June 61) OTS price $5.60

Radio Corp. of America, Moorestown, N. J.
ELECTROMAGNETIC WAVE PROPAGATION AND RADIATION CHARACTERISTICS OF ANISOTROPIC PLASMAS.
Rept. on Down-Range Anti-Ballistic Measurement Program (DAMP), Apr 61, 48p. incl. illus. tables.
(Contract DA 36-034-ORD-3144)
(ARPA Order no. 51) Unclassified report

DESCRIPTORS: *Plasma physics, *Antiaircraft defense systems, *Electromagnetic waves, Propagation, Electromagnetic properties, Magnetic fields, *Re-entry vehicles, Ionospheric propagation, Absorption, Astrophysics, Magneto-optic rotation, Mathematical analysis, Theory, Spectrographic analysis.

A study was made of electromagnetic properties of homogeneous anisotropic plasmas. The propagation characteristics of electromagnetic waves in anisotropic plasmas are examined for propagation parallel to and perpendicular to the applied d-c magnetic field. The existence of very low frequency pass-bands due to ion effects is noted. Faraday rotation due to the earth's magnetic field is considered for the ionosphere and the plasma sheath of a re-entry vehicle. A generalized and exact form of Kirchhoff's law is used to obtain the absorptivity of a plasma from its electromagnetic properties. The absorptivity of an isotropic and anisotropic plasma slab is computed for normal incidence and the effects of electron collision frequency, slab thickness, stop-bands and boundary effects on the radiation spectrum is presented. (Author)

AD-257 299 Div. 25
(9 June 61) OTS price $2.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
GENERALIZATION OF THE FREQUENCY-POWER FORMULAS OF MANLEY AND ROWE,
by Paul Penfield, Jr. 1960, 26p. 14 refs.
(Contract AF 33(616)3984)
Unclassified report

Presented at the Symposium on Active Networks and Feedback Systems, Polytechnic Institute of Brooklyn, April 19-21, 1960.

DESCRIPTORS: *Power, *Radiofrequency, *Frequency converters, *Electrical networks, Energy, Electromagnetic fields, Electron beams, Ferrites, Capacitors, Variable capacitors, Mathematical analysis, Nonlinear systems.

It is interesting to inquire what physical systems obey the Manley-Rowe frequency-power formulas (Proc. I.R.E. 44:904-913, 1956). Surprisingly, losslessness is neither a necessary nor a sufficient condition. However, systems characterized by a (possibly explicitly time-varying) energy state function, such as the Lagrangian, Hamiltonian, internal energy, or co-energy, obey the formulas. Distributed systems described by Hamilton's principal (H. Goldstein, Classical Mechanics. Reading, Mass., Addison-Wesley Pub. Co., 1950; Chap. 11. P. M. Morse and H. Feshbach, Methods of Theoretical Physics. New York, McGraw-Hill, 1953, part 1, chapter 3, Section 3-4) obey the formulas in such a way that the powers can be evaluated at the boundaries of the systems. The formulas thus relate quantitites of engineering interest: the powers through the ports. Such distributed systems include nonlinear electromagnetic media, ferrites, electron beams, and acoustic fields. (Author)

AD-257 306 Div. 25, 20
(8 June 61) OTS price $14.50

California U., Berkeley.
NOTES TAKEN AT THE LECTURES OF PROFESSOR LAURENT SCHWARTZ ON THE APPLICATION OF DISTRIBUTIONS TO THE STUDY OF ELEMENTARY PARTICLES IN RELATIVISTIC QUANTUM MECHANICS.
Mar 61. 207p. incl. illus. (Technical rept. no. 7)
(Contract Nonr-22260, Proj. NR 041-221)
Unclassified report

DESCRIPTORS: *Quantum mechanics, Relativity theory, Nuclear physics, *Particles, Mathematical analysis, Mathematics, Topology.

Contents:
Position of the problem
The set $\mathbb{H}$ of the universal particles and its structure
Universal particles and the translation invariance: Kernel simplification
Elementary particles and the rotation invariance: support of $\mathcal{F}(H_u)$
Elementary particles and the properties relative to $\vec{F}$
Definitions of some physical notions

AD-257 315 Div. 25
(9 June 61) OTS price $1.60

Cornell U., Ithaca, N. Y.
INTERFERENCE MICROSCOPY OF CRYSTALLINE HIGH POLYMERS. DETERMINATION OF THE THICKNESS OF SINGLE CRYSTALS,
by Bernhard Wunderlich and Peter Sullivan.
30 May 61, 18p. incl. illus. 12 refs. (Technical rept. no. 1)
(Contract Nonr-40144, Proj. NR 051-428)
Unclassified report

DESCRIPTORS: *Ethylenes, Polymers, *Single crystals, Crystals, Crystallization, Growth, *Microscopy, Microphotography, Microscopes, Photographic analysis, Optical analysis, Crystal structure, Refractive index, Test equipment, Measurement, Thickness, Interference, *Interferometers, Determination.

The quantitative analysis of single crystals of polyethylene with the two beam interference microscope has been described. The thickness of single crystals formed at 87 C is 101 angstroms. The variation thickness is equal or less than 6 angstroms. A general pattern of growth is discussed. (Author)

AD-257 317 Div. 25, 17
(9 June 61) OTS price $1.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE ELECTRICAL RESISTIVITY OF Mn3ZnC BETWEEN 4.2 K AND 630 K,
by M. L. Swanson and S. A. Friedberg. 24 May 61, 10p. incl. illus. (Technical rept. no. 10)
(Contract Nonr-76005, Proj. NR-018-301)
Unclassified report

DESCRIPTORS: *Resistance, *Manganese alloys, *Zinc alloys, *Carbon alloys, Temperature, Cryogenics, Magnetic properties, Spin, Ferromagnetism, Scattering, Carbides, Intermetallic compounds.

The electrical resistivity of an alloy having approximately the composition Mn3ZnC has been measured between 4.2 K and 630 K. From a high residual value the resistivity increases with temperature in a complicated way up to 550 K, becoming temperature-independent above that point. Two anomalous regions are evident corresponding to the magnetic transitions occurring in this substance at about 230 K and 470 K. The general features of the results are interpreted on the basis of a spin-disorder scattering picture. (Author)

AD-257 322 Div. 25
(9 June 61) OTS price $8.60

Polytechnic Inst. of Brooklyn, N. Y.
STRESSES IN ECCENTRIC NON-UNIFORM REINFORCING RINGS OF PRESSURIZED CIRCULAR CYLINDRICAL SHELLS,
by Arnold Allentuch and Joseph Kempner. Mar 61, 79p. illus. 14 refs (PIBAL rept. no. 555)
(Contract Nonr-83914, Proj. 064-167)
Unclassified report

DESCRIPTORS: Cylindrical bodies, Structural shells, *Stiffened cylinders, Rings, Shear stresses, Deflection, Hydrostatic pressure, Pressure vessels, Deformation, Moments, Differential equations, Load distribution, Series, *Stresses, Mathematical analysis, Structures.

The numerical results of the solution of the interaction problem of a hydrostatically loaded, infinitely long circular cylindrical shell, reinforced by equally spaced stepwise discontinuous rings, with two uniform halves but different mean radii and cross sectional properties, indicate a high bending stress concentration at the

discontinuity. The method of solution is limited by the magnitude of the eccentricity and area ratios. That is, convergence of the interaction load expressed as a Fourier series is very slow if these quantities are high. Because of the complex nature of the problem, six approximate analyses have been studied. These approximations yield results which, when compared with the more complete analysis, are reasonable and useful. (Author)

AD-257 328 Div. 25, 30
(9 June 61) OTS price $12.00

Tennessee U., Knoxville.
INTENSITIES AND LINE SHAPES OF THE FUNDAMENTAL VIBRATION ROTATION BAND OF HF -- AND OTHER INFRARED STUDIES.
by W. E. Deeds, N. M. Gailar and others. Final rept. 31 Mar 61, 156p. incl. illus. tables.
(Contract AF 19(604)2281)
(AFCRL-465) Unclassified report

DESCRIPTORS: *Infrared spectroscopy, *Molecular rotation, Measurement, Molecular spectroscopy, Instrumentation, Absorption, Intensity, Optical spectrometers, Hydrogen compounds, Fluorides, Recording devices, Tables.

An account is given of the results achieved, in a study of intensities, widths and shapes of vibration-rotation lines in the spectrum of HF; and in other problems in infrared spectroscopy. A general description is given of the vacuum-grating spectrometer with which the measurements were made. Special technical problems are discussed which are encountered in radiation source stabilization; optical problems--including filtering, focussing, stray light, gratings, etc.; the gas handling system--including the peculiar case of HF, system layout, and absorption cells; calibration techniques--including the neon hollow-cathode discharge tube, standard lines, overlapping grating orders, and accuracy; data taking and handling--including discussion of slit functions and corrections, and examples of lines for which corrections were made. Results are shown in tables of appropriate slit functions, percent transmission for all the HF lines in the P and R branches recorded for various cell lengths and pressures. A reprint is included of a paper entitled Rotational Fine Structure in the Dimer of HF (J. Opt. Soc. America 50: 1264, (1960)) in which resolution of the dimer spectrum of HF is discussed. Brief discussions are given on remeasurement of the fundamental bands of CH_3Cl and on the conversion of a Perkin-Elmer model 12 spectrometer to far infrared operation for the study of intensities of the pure rotation lines of HF. (Author)

AD-257 343 Div. 25, 13
(9 June 61) OTS price $1.60

Frankford Arsenal, Philadelphia, Pa.
NONLINEAR DEFLECTION OF THE SEMICIRCULAR CANTILEVER BEAM WITH VERTICAL LOADING.
by E. Pearson. Apr 61. 15p. incl. illus. tables. (Memo. rept. no. M61-25-1)
(Proj. no. 505-01-003; In cooperation with Associated Spring Corp., Bristol, Conn.)
Unclassified report

DESCRIPTORS: *Springs, Helical springs, *Cantilever beams, *Deflection, Torque, Mechanical properties, *Mathematical analysis, Nonlinear systems, *Deformation, Numerical analysis.

An analysis of the load vs deflection relation for a single-loop spring shown can be reduced to the problem of large deflections for a curved cantilever beam. The deflections considered extend well past the linear range. If the spring is originally circular, the cantilever beam will be semicircular. Besides the end point deflection, it is of interest to determine the position of any point on the spring for a given load to insure that there is proper clearance with related objects. The numerical method used generates the shape of the deflected beam. Several approximations are made but the final result is substantiated by experimental measurements. (Author)

AD-257 345 Div. 25, 8
(9 June 61) OTS price $6.60

Louvain U. (Belgium).
SEMICONDUCTIVE PROPERTIES OF CdS. FORMING, ELECTRON ACTIVATION ENERGY, HALL EFFECT,
by A. Luyckx, J. Vandewauwer, and Paul Coopmans. Technical notes no. 1, Sep 58-Aug 60. Aug 60, 62p. incl. illus. tables.
(Contract AF 61(052)166)
(RADC TN 61-39) Unclassified report

DESCRIPTORS: Cadmium compounds, Sulfides, *Semiconductors, *Single crystals, Growth, Sublimation, Zinc compounds, Indium, *Hall effect, Catalysts, *Intermetallic compounds, Phosphors, Electromagnetic properties, Measurement, Argon, Electrons.

Measurements and calculations were made to determine the Hall effect, number of electron carriers, mobility, and energy of activation of electrons for extrinsic and intrinsic conduction for several CdS single crystals activated with In, Ga, Ag. These measurements became possible with a good accuracy only after a forming with high frequency. Comparison was done between this forming and the well known heating in argon at 850 C. Hall effect measurements were reproducible and gave strait lines with variation of magnetic field or current. Experiments showed that this forming was a volume effect although there was also a surface effect on contacts the extrinsic conduction formular for CdS, Ag, In is presented. Energy of activation was 0,00384 eV for CdS, Ag, In and contacts of Sn. (Author)

AD-257 383 Div. 25, 10
(12 June 61) OTS price $1.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
EMPIRICAL BOND ENERGIES,
by Frank Wilson, Jr. Apr 61, 16p. incl. tables, 15 refs. (Rept. no. AFFTC TR 61-27)
Unclassified report

DESCRIPTORS: *Chemical bonds, Energy, *Thermodynamics, Molecules, Heat of formation, Heat of fusion, Enthalpy, Phase transitions, Vaporization, Gases, Vapors, Liquids, Solids, *Thermochemistry, Tables,

Specific impulse, Mathematical analysis, *Rocket research, *Rocket propellants, Boron compounds, Nitrogen compounds, Dissociation, Entropy, Magnesium compounds..

A consistent set of bond energy values are calculated on the assumption that bond energy nonconstancies are a minimum when determined from compounds in which all the constituent elements exhibit their normal valency. Several empirical rules for estimating the heats of vaporization and fusion are included. The report contains sufficient data for the estimation of heats of formation of compounds. In many cases estimations can be made within a few kilocalories. (Author)

AD-257 395 Div. 25, 8
(12 June 61) OTS price $1.10

Compagnie Generale de Telegraphie Sans Fil (France).
PREPARATION AND PROPERTIES OF THERMOELECTRIC MATERIALS.
Quarterly progress rept. no. 3, 1 Feb-30 Apr 61. 30 Apr 61, 7p. incl. illus.
(Contract DA 91-591-EUC-1505)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Semiconductors, *Molybdenum compounds, *Tellurides, Selenides, Tungsten compounds, Bromine, Single crystals, Preparation, Synthesis, Electrical properties, Physical properties.

Molybdenum telluride, MoTe2, was prepared by chemical transport reaction. Pure Mo and Te are placed in a horizontal quartz tube at about 800 C. Deposition is accomplished at about 750 C wtih Br as the transport agent. The temperature gradient is important, small variations in temperature stopping the transport phenomenon and sometimes causing wide and thin crystals, 1 to 2 sq cm in area, to grow on the Mo; the crystals are probably Mo2Te3. The specific gravity of MoTe2 is 8.5; the crystals are soft and make black marks on paper. Standard X-ray analysis on single crystals of MoTe2 was performed with the rotating crystal method (Cu K-alpha radiation). The first lattice constant of the hexagonal system was expressed by the equation a equals 3.52 + or - 0.05 angstrom units. With the axis of rotation parallel to the c axis, c equals 14 + or - 0.2 angstroms. The following compounds are also being prepared: MoSe2, WSe2, and WTe2.

AD-257 397 Div. 25, 8
(12 June 61) OTS price $1.10

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
STUDY OF ELECTROMAGNETIC INTERACTION IN PLASMAS, by R. W. Gould and D. G. Dow. Quarterly progress rept. no. 5, 1 Jan-31 Mar 61. 31 Mar 61, 5p. incl. illus.
(Contract DA 36-039-sc-85317)
Unclassified report

DESCRIPTORS: Microwaves, *Plasma physics, Electron beams, *Plasma oscillations, Microwave oscillators, Cyclotrons, Electron tubes, Electromagnetic waves, Propagation, Cesium, Scattering, Measurement, Magnetic fields, Discharge tubes, Design, Tests, Mathematical analysis.

A cyclotron orbit plasma oscillator is being rebuilt with a tungsten cathode. A systematic study of the dispersion relation in a plasma with an electron beam and magnetic field was undertaken. The approach is to use the exact equations for wave propagation in formulation and make approximations only in the mathematical evaluation. A cesium plasma tube was tested and gives plasma densities in the range 10 to the 11th power ions/cu. cm. Construction started on a new cesium plasma tube which will be used to measure diffusion rates in a magnetic field. (Author)

AD-257 421 Div. 25, 14
(12 June 61) OTS price $2.60

General Electric Co., Schenectady, N. Y.
THE ELECTRICAL CONDUCTION MECHANISM IN ULTRA-THIN, EVAPORATED METAL FILMS, by C. A. Neugebauer and M. B. Webb. June 61, 22p. incl. illus. 19 refs. (Rept. no. 61-GC-184; Scientific rept. no. 1)
(Contract AF 19(604)5566)
(AFCRL-345)
Unclassified report

DESCRIPTORS: *Metal films, Thin films, *Electrical conductance, Particles, Temperature, Resistance, Electrical properties, Thermionic emissions, Conductivity.

The electrical conduction mechanism in the film plane of ultrathin, evaporated metal films was investigated. These films consist of a planar array of many small discrete islands. The conduction process consists of, first, charge carrier creation which is thermally activated and involves charge transfer between initially neutral particles, and, second, the drift velocity of these charges in an applied field. Charge transfer between particles occurs by tunneling. The following features were predicted and can be verified experimentally: the conductivity depends exponentially on reciprocal temperature, and it should be independent of field at low fields. Deviations from the exponential temperature dependence can be understood in terms of a spectrum of activation energies, while deviations from Ohm's law at high fields can be explained readily in terms of a field dependent activation energy. (Author)

AD-257 432 Div. 25
(12 June 61) OTS price $2.60

Stockholm U. (Sweden).
ON THE BAND THEORY OF MOLECULAR CRYSTALS, by Stig Flodmark. Aug 60, 19p. incl. illus. tables. (Technical rept. no. 1)
(Contract DA 91-591-EUC-1391)
Unclassified report

DESCRIPTORS: *Crystals, Crystal structure, Molecular structure, Lattices, *Atomic orbitals, Quantum mechanics, Molecular rotation, Theory, *Zirconium.

The orbitals of the electrons in a crystal adapted to the translational symmetry of the atomic framework are the so-called Bloch functions. In the the crystal orbital method presented, the use of these orbitals in the Schrodinger equation gives one secular equation for every wave vector. The basic orbitals in this secular equation are the different atomic orbitals for the atoms in the unit cell. (Author)

AD-257 433 Div. 25, 30
(12 June 61) OTS price $1.60

Stockholm U. (Sweden).
EXERCISE IN ALPHA PROGRAMMING: TABLE OF MOLECULAR A AND B FUNCTIONS,
by Stig Flodmark and Bjorn Roos. Nov 60. 12p. incl. illus. tables. (Technical rept., no. 2)
(Contract DA 91-591-EUC-1391)
Unclassified report

DESCRIPTORS: Coding, Functions, Tables, *Programming, Digital computers, *Molecular structure.

A program was made using the direct Besk code for the molecular A and B functions. These functions were printed in a duplicated table still available at the Institute of Theoretical Physics at the University of Stockholm. The index here goes from 0 to 8 and the A and B functions are printed for arguments alpha and beta between 0 and 50. In the region between 0 and 10 the intervals are 0.01 and in the region between 10 and 50 the interyals are 0.1. So this table is very comprehensive. It contains 150 pages with about 27000 A and B function values, each with 7 significant decimals and an explicit 10-exponent with 2 figures. In many cases, greater accuracy is necessary than can be obtained from interpolation in the table. Hence it was found very suitable to use the A and B functions as a simple subject for an exercise in alpha programming in connection with the course for this coding system. (Author)

AD-257 434 Div. 25, 30
(12 June 61) OTS price $5.60

Stockholm U. (Sweden).
CALCULATION AND TABULATION OF EXPANSION COEFFICIENTS FOR N SHELL MOLECULAR TWO-CENTER INTEGRALS BY MEANS OF THE ELECTRONIC COMPUTER BESK,
by Stig Flodmark. Dec 60. 1v. incl. illus. tables. (Technical rept. no. 3)
(Contract DA 91-591-EUC-1391)
Unclassified report

DESCRIPTORS: *Electron transitions, Integral equations, Mathematical analysis, Tables, *Programming, *Molecular rotation, Functions, *Atomic orbitals, Digital computers, Solid state physics.

The formulae for all the two-center integrals occurring in the MO-LCAO method with N shell Slater atomic orbitals is found from the tables of coefficients. The tables were computed by means of Besk according to a flow scheme. Using the corresponding program, which is working separately, it is possible to calculate the actual coefficients for integrals containing other shells as well. (Author)

AD-257 435 Div. 25
(12 June 61) OTS price $3.60

Stockholm U. (Sweden).
THEORETICAL INVESTIGATION OF THE ELECTRONIC ENERGY BANDS FOR THE ZIRCONIUM-OXYGEN CRYSTAL. PART I. METHODS OF INVESTIGATION,
by Stig Flodmark. Jan 61. 32p. incl. illus. tables. (Technical rept. no. 4)
(Contract DA 91-591-EUC-1391)
Unclassified report

DESCRIPTORS: *Electron transitions, Solid state physics, Theory, Zirconium compounds, Oxides, *Crystal structure, Electron charge, Ions, Operations (Mathematics), Perturbation theory, *Atomic orbitals, Integral equations.

AD-257 441 Div. 25, 9
(12 June 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
KINEMATIC FORMULATION OF ROTATIONAL FLOW IN MAGNETOGASDYNAMICS,
by Marcel Vinokur. Technical rept. on Flight Sciences. May 61, 18p. (Rept. no. 6-90-61-10)
Unclassified report

DESCRIPTORS: *Gas flow, *Plasma physics, Rotation, *Magnetohydrodynamics, Magnetic fields, Fluid mechanics, Dynamics, Equations, Mathematical analysis, Gases, Thermodynamics.

The steady, rotational flow of a perfectly conducting, ideal gas in the presence of a magnetic field is treated. The object is to seek a kinematic formulation -i.e., a reduction of the original equations describing the flow to a form in which the velocity is the only dependent variable. This formulation has been made for two cases: plane flow in a transverse magnetic field and three-dimensional flow in which the magnetic field is parallel to the velocity everywhere. In both cases the kinematic formulation leads to a single vector equation whose solution completely determines the flow. The explicit form of the equation is derived for a perfect gas and is found to be independent of the strength of the magnetic field in both cases. In the parallel field case, it is necessary to employ a transformation due to Peyret which reduces the magnetogasdynamic flow to an ordinary gasdynamic flow of a fictitious gas. The form of the resulting kinematic equation is found to depend only on the Mach number of the original flow. (Author)

AD-257 442 Div. 25, 8
(12 June 61) OTS price $8.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 8. SOLID STATE RESEARCH.
Quarterly progress rept. 15 Apr 61. 15 Apr 61, 77p. incl. illus. 59 refs.
(Contract AF 19(604)7400)
(AFESD TN 61-1007) Unclassified report

DESCRIPTORS: *Semiconductors, Chemistry, Alloys, Intermetallic compounds, Magnetic materials, *Solids, Transistors, Display

systems, Magnets, Microwaves, Magnetism, Thin films, Diodes, *Solid state physics, Amplifiers, Light.

Contents:
Solid state device design
Chemistry
Materials research
Band structure of solids
Microwave and magnetic properties of solids
Magnetic materials
Magnetic films
Semiconductor components
Optics and infrared

AD-257 449 Div. 25, 8
(12 June 61) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ON MAGNETOHYDRODYNAMIC STABILITY OF A SELF-GRAVITATING PLASMA,
by R. K. Jaggi. Feb 61, 25p. (Technical note no. BN-231)
(Contract AF 18(600)1315)
(AFOSR-747) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Gravity, Stability, Plasma physics, *Plasma oscillations, *Magnetic fields, Mathematical analysis, Perturbation theory.

Following Kruskal and Schwarzschild (Proc. Roy. Soc. A223:348, 1954) boundary conditions are deduced which apply on the free surface of a self-gravitating plasma. These equations are applied to study the stability problems of a self-gravitating plasma. It is proved that the stable length of the compression waves in an infinite homogeneous plasma is increased by the presence of a uniform magnetic field. The stability of a self-gravitating plasma cylinder of infinite length is worked out and it is seen that a magnetic field of the order of 5.10 to the 6th power gauss increases the stable length of the plasma cylinder by more than ten times. (Author)

AD-257 460 Div. 25, 15
(12 June 61) OTS price $6.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
THE GEOMETRY OF FLUID FLOWS IN RELATIVITY,
by E. Ramnath Suryanarayan, and N. Coburn. Doctoral thesis. Final rept. Apr 61. 63p. (Rept. no. 2767-6-F)
(Contract DA 20-018-ORD-17213)
(AROD rept. no. 1986-3) Unclassified report

DESCRIPTORS: *Relativity theory, *Fluid flow, Geometry, Thermodynamics, *Tensor analysis, Energy, Gravity, Geodesics, Motion, Entropy, Vortices, Vector analysis, Fluid mechanics, Surfaces, Integration.

Contents:
Thermodynamics
Intrinsic formulations of basic relations
Intrinsic form of the equations of motion and the equation of conservation of mass
Properties of fluid flow when the orthogonal ennuple lies along the world-line vectors and along the first, second and third normals of the world-line
Integration of the equations of motion in the case of a degenerate perfect fluid for isentropic flow
Geodesic flow in the space-time of special relativity
The equations of motion
The hypersurface, p equals constant
The codazzi equations
Two special hypersurfaces, p equals constant
Reduction of the geodesic flow to Newtonian mechanics, in the case when the hypersurfaces, p equals constant, are hyperspheres
Transition to Newtonian mechanics
Intrinsic forms of equations of motion and conservation of matter, when the world-lines lie on a hypersurface S sub 3
Hypersurfaces containing the World-Lines
Intrinsic equations
The vorticity tensor and the vorticity vector
General flows
Steady flows

AD-257 463 Div. 25
(12 June 61) OTS price $3.60

Naval Ordnance Test Station, China Lake, Calif.
PLASTICITY AND NON-LINEAR ELASTIC STRAINS,
by Marvin E. Backman. 27 Apr 61. 30p. incl. illus. 13 refs. (NOTS TP 2665)
(NAVWEPS rept. no. 7648) Unclassified report

DESCRIPTORS: Metals, *Deformation, *Plasticity, *Elasticity, Theory, Mathematical analysis, Thermodynamics, Solid state physics, Impact shocks, Load distribution, Stresses.

An attempt is made to obtain a description of the material behavior of a metal which is appropriate for high velocity impact and explosive loading. A thermodynamic argument, which includes simple principles of irreversible processes, is used to show how a non-linear elastic description of material behavior is modified by a flow law of plasticity. For an isotropic solid general expressions are obtained for the relation between stress and elastic strain and the relation between plastic strain rate and functions of the stress invariants. These relations are combined for the special strain conditions existing in plane waves in an extended medium to give the time rate of change of stress as a function of the time rate of change of strain, the stress invariants, the total strain and the plastic strain. (Author)

AD-257 464 Div. 25, 22
(12 June 61) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
THE INFRARED SPECTRAL RADIANT INTENSITY OF EXPLODING WIRES,
by Ralph Wilson. 31 May 61, 28p. incl. illus.
(NOTS TP 2697)
Unclassified report

DESCRIPTORS: *Wire, Light, Lighting equipment, *Infrared spectroscopy, *Infrared radiation, *Explosions, Tests, Electric discharges, *Spectrographic analysis, Measurement, Blackbody radiation.

Quantitative data are presented concerning the time history of the spectral radiant intensity of the explosion of small stainless steel wires. The explosions were by electrical discharge. The history was recorded for 9 milliseconds after initial discharge, and radiant intensity was measured over the 2- and 6-micron region in half-micron bands. (Author)

Division 25 - PHYSICS

AD-257 465 Div. 25
(12 June 61) OTS price $1.60

Naval Research Lab., Washington, D. C.
VIBRATIONAL CONTRIBUTIONS TO SPECIFIC HEAT NEAR PHASE CHANGES,
by H. B. Rosenstock. Final phase rept. 8 May 61. 10p. incl. illus. (NRL rept. no. 5610)
Unclassified report

DESCRIPTORS: *Lattices, Temperature, *Specific heat, *Phase transitions, *Solid state physics, Atomic energy levels.

Near a phase, the interatomic forces in a solid are likely to be temperature-dependent, and the vibrational contribution to the specific heat will be affected by this. It is found that a specific heat vs temperature relationship very close to the familiar lambda point curve can be obtained by considering this effect. (Author)

AD-257 466 Div. 25, 10
(12 June 61) OTS price $2.60

Little, Arthur D., Inc., Cambridge, Mass.
RADIATION TRANSFER BY CLOSELY SPACED SHIELDS,
by A. G. Emslie. Technical rept. on Liquid Propellant Losses During Space Flight. May 61. 19p. incl. illus. (Rept. no. 63270-04-02)
(Contract NAS 5-664)
Unclassified report

DESCRIPTORS: Heat transfer, *Thermal radiation, *Shielding, Foils, Thermodynamics, Solar energy, *Thermal insulation, Liquid rocket propellants, Liquefied gases, Cryogenics.

The effects are investigated which occur when radiation shields are placed too close to each other. The anticipated effect is that the radiation transfer rate will increase many times. Such effect would be serious in the storage of cryogenic fuels for long periods in space. Effective protection of such fuels from solar radiation requires total shielding consisting of about 100 layers of metal foil. If the shielding is to be of reasonable over-all thickness, the spacing between the individual foils may be about 0.1 mm. Now at a temperature of 20 K the peak of the Planck radiation distribution corresponds to a wavelength of 0.15 mm. Thus the wavelength of the radiation is of the same order of magnitude as the separation of the foils. Under these conditions two effects causing increase in radiation transfer begin to set in. One of these is the effect of constructive interference when the wave emitted by a foil is reflected back and forth in the small gap between two foils. This results in a very considerable increase in transmission of energy across the gap when the spacing is small compared with the wavelength of the radiation. The other effect can be called radiation tunneling and has to do with the escape of trapped radiation that is undergoing total internal reflection inside one of the metal foils. (Author)

AD-257 481 Div. 25, 4
(12 June 61) OTS price $2.60

Raytheon Co., Waltham, Mass.
CHEMISTRY OF MAGNETIC OXIDES. PART I. PHASE EQUILIBRIA IN THE FERRITE REGION OF THE SYSTEM Fe-Co-O,
by B. D. Roiter and A. E. Paladino. 12 Apr 61, 23p. incl. illus. 4 refs. (Scientific rept. no. 3; (Rept. no. S-265)
(Contract AF 19(604)5511)
(AFCRL-340)
Unclassified report

DESCRIPTORS: Spinels, Iron compounds, Cobalt compounds, *Oxides, Temperature, Pressure, Atmosphere, Solids, Solutions, *Magnetic properties, Magnetism, Measurement, Phase studies, Phase transitions, *Magnetic materials.

Phase relations in the system Fe-Co-O have been determined between 1000 C and 1300 C in oxygen pressures from 0.01 to 20 atmospheres. Only that portion of the system between $CoFe_2O_4$ and Co_3O_4 was considered in order to determine those conditions under which a complete series of solid solutions could be prepared. No field-width on either side of oxygen stoichiometry was detected for solid solutions between $CoFe_2O_4$ and Co_3O_4. (Author)

AD-257 483 Div. 25, 12, 22, 27
(12 June 61) OTS price $3.60

Rocketdyne, Canoga Park, Calif.
SPECTRAL RADIOMETRY AND TWO-PATH PYROMETRY OF ROCKET EXHAUST JETS,
by Frederick S. Simmons and Arthur G. DeBell. 1 May 61, 32p. incl. illus. 14 refs. (Research rept. no. RR 61-9)
(Sponsored by the Air Force Cambridge Research Laboratories and the Advanced Research Projects Agency)
Unclassified report

Presented to the Fourth Symposium on Temperature, Its Measurement and Control in Science and Industry, Columbus, Ohio, March 29, 1961.

DESCRIPTORS: *Exhaust gases, Rocket motors, Jets, *Pyrometers, *Radiometers, Analysis, Photographic equipment, Spectrophotometers, Infrared spectroscopy, Ultraviolet spectroscopy, *Optical spectrometers, Measurement, Temperature, Spectrographic analysis.

Knowledge of the temperature and radiative properties of the exhaust jets from modern rocket engines can only come from direct measurements of the spectral radiance of the exhaust products. The fundamental relations governing radiative transfer are briefly reviewed, and the methods of relating the observed spectral radiance of a gaseous source to its intrinsic properties are outlined. The inhomogeneous character of rocket exhaust jets is illustrated. Descriptions are given of several unique instruments of exhaust radiation: a telespectrograph, for measuring spectral radiance in the ultraviolet and visible; an infrared spectral and total teleradiometer for similar measurements in the infrared; a photographic pyrometer and a Two-Path Spectral Radiometer for two-path measurements of gas temperature and spectral emissivity. Typical results obtained with the various instruments are presented and discussed. (Author)

AD-257 488 Div. 25, 8
(12 June 61) OTS price $1.60

Syracuse U. Research Inst., N. Y.
PARAMAGNETIC RESONANCE IN SEMICONDUCTORS,
by A. Honig. Final rept. 29 Apr 61. 14p. illus. 22 refs.
(Contract AF 18(603)50)
(AFOSR-660) Unclassified report

DESCRIPTORS: *Semiconductors, Silicon, Nuclear spins, *Crystals, Magnetic fields, Magnetic moments, Nuclear magnetic moments, Lattices, Relaxation time, Impurities, Infrared radiation, *Paramagnetic resonance, Scientific research.

An extensively referenced summary is presented of research conducted on the following subjects: (1) electron spin - lattice relaxation in silicon, (2) electron spin-spin relaxation in silicon, (3) gamma ray anisotropy from dynamically oriented nuclei, and (4) combined infrared radiation - spin resonance studies. The electron spin-spin relaxation work is presented in some detail. Results from the combined infrared radiation - spin resonance program relate to (1) trapping lifetimes and transport phenomena, (2) conduction electron - phosphorus impurity atom singlet exchange cross section in silicon, (3) photo-induced electron spin - lattice relaxation mechanisms, (4) compensation dependent electron spin - lattice relaxation mechanism, and (5) a metastable photoexcited paramagnetic state in silicon. (Author)

AD-257 493 Div. 25, 14
(12 June 61) OTS price $1.60

Textile Research Inst., Princeton, N. J.
AN EXPRESSION FOR ORIENTATION IN CELLULOSE FIBERS,
by V. D. Gupta. May 61. 7p. illus. (Technical rept. no. 22)
(Contracts Nonr-09000 and Nonr-09001)
Unclassified report

DESCRIPTORS: Fibers, *Synthetic fibers, *Cellulose, Crystals, *Crystal structure, Polarization, X-ray photography, Mathematical analysis, Factor analysis.

Hermans' orientation factor can be evaluated only when the diatropic and paratropic interferences arise from planes which form an orthogonal set. This is only approximately satisfied in case of both Cellulose I and Cellulose II. In the present communication an exact expression has been derived which can be evaluated from X-ray measurements, angle between face normals of paratropic interferences and the optical constants. (Author)

AD-257 497 Div. 25
(12 June 61) OTS price $7.60

Utah U., Salt Lake City.
EFFECTS OF EDGE MATERIAL ON WIDE ANGLE DIFFRACTION.
by Gordon R. Orme. Master's thesis. June 61, 1v. incl. illus. 36 refs.
(Contract AF 49(638)799)
Unclassified report

DESCRIPTORS: *Light, *Diffraction, Theory, Photometers, Photomultipliers, Polarization, Tests, Reflection, Test equipment, Mercury lamps, Power supplies, Electronic circuits, Phototubes, Test methods, Wedges, Copper, Silver, Measurement, Electronic equipment.

Precision photometric traces of light diffracted 70 degrees into the shadow region were made for four different diffracting edges. Light of wavelengths 4358A or 5461A was normally incident on the edge for all cases. Intensity traces as a function of diffracting angle were made for light polarized perpendicularly and parallel to the edge for both wave-lengths. The diffracted light was measured by a liquid-nitrogen-cooled 1P21 electron photomultiplier photometer. A new solid state amplifier system was used to lend high stability to the measurements taken. Although experimental conditions do not rigorously satisfy Sommerfeld's boundary conditions, comparison is made with Sommerfeld theory to show in general how the patterns for the different metals vary. In general the traces agree to within an order of magnitude with Sommerfeld theory. The different metals and wavelengths exhibit a pronounced effect on the intensity distribution and polarization of the light diffracted into the shadow region. (Author)

AD-257 502 Div. 25, 13
(12 June 61) OTS price $5.60

Mathematics Research Center, U. of Wisconsin, Madison.
ANTIPLANE ELASTIC SYSTEMS V. THE FLEXURE OF ISOTROPIC BEAMS,
by L. M. Milne-Thomson. March 61, 48p. incl. illus. tables (MRC Technical summary rept. no. 221)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: Stresses, *Cantilever beams, Mathematical analysis, Beams, Shear stresses, Deformation, Deflection, *Mechanics.

Contents:
The flexure problem
The stress component zz in the isotropic case
The geometrical parameters of the cross-section
The shears xz and yz
The displacement
The centre of flexure
Cross-section a circle
Cross-section a circular annulus
Cross-section a limacon
Cross-section one loop of Bernoulli's lemniscate
Half-sections
Shear stress functions
Timoshenko's stress function
Cross-section an ellipse
Cross-section an equilateral triangle
Gauss's theorem and integration by parts
Virtual stresses and Timoshenko's stress function
Cross-section an ellipse (virtual stresses)
de St Venant's flexure function
Cross-section a rectangle
Application of the principle of virtual work
Cross-section an ellipse (virtual work)
Cross-section a rectangle (virtual work)

AD-257 506 Div. 25, 13
(12 June 61) OTS price $4.60

Mathematics Research Center, U. of Wisconsin, Madison.
ANTIPLANE ELASTIC SYSTEMS VI. ANTIPLANE OF

ELASTIC SYMMETRY,
by L. M. Milne-Thomson. April 61, 40p. incl. illus. tables (NRC Technical summary rept. no. 228)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: Stresses, Mathematical analysis, *Mechanical properties, Torque, *Elasticity, *Mechanics.

It is shown how the presence of an antiplane of elasticity symmetry permits the reduction of antiplane problems concerning anisotropic material to corresponding problems concerning isotropic material. (Author)

AD-257 530 Div. 25, 1, 12, 17
(13 June 61) OTS price $13.50

Denver Research Inst., Colo.
INVESTIGATION OF ELASTIC WAVES IN THIN PLATES,
by T. N. Grigsby and E. J. Tajchman. 12 June 60, 200p. incl. illus. tables, 106 refs.
(Contract DA 23-072-505-ORD-1)
(Rept. no. WAL TR 811.8/2-1) Unclassified report

DESCRIPTORS: *Metal plates, *Ultrasonics, Test methods, *Sheets, *Vibration, *Non-destructive testing, Wave transmission, Elasticity, Electromagnetic waves, Ultrasonic radiation, Welds, Test facilities, Theory, Mathematical analysis, *Bibliography, Guided missiles, Spaceships, Aircraft, Metals, Thickness.

A survey of the theory of Lamb waves is given. Experiments were conducted to determine how thin a plate must be before the modes properly called Lamb waves will be excited. Measurements of group velocity of Lamb waves were made and the values agreed with calculated values. The analogy between sonic waves guided by elastic plates and electromagnetic waves is discussed. Measurements were made of the insertion loss caused (1) by artificial flaws consisted of 1/32 in.-wide sawcuts of varying depths, and (2) by eight different butt welds in 1/32 in.-steel plate. A method of locating flaws in plates by the use of Lamb waves showed promise. (Author)

AD-257 547 Div. 25, 4, 8
(13 June 61) OTS price $1.60

Surface Chemistry Lab., Lehigh U., Bethlehem, Pa.
ADSORPTION STUDIES ON SEMICONDUCTOR SURFACES,
by A. C. Zettlemoyer, G. Srinivasan and C. Hassis. Final summary rept., 15 Apr 60-14 Apr 61. 14 Apr 61, 11p. incl. illus. table.
(Contract DA 36-039-sc-85130, Proj. 36039)
Unclassified report

DESCRIPTORS: *Germanium, Oxides, Films, Thin films, *Semiconductors, *Adsorption, Propanols, Acetic acid, Electrons, Surfaces, Surface properties, Resistance, Temperature, Organic coatings, Powder metals.

Adsorption of propanol and acetic acid on Ge powders with at least a monomolecular layer of oxide was measured at 25 C. on samples outgassed at different temperatures in the range 25-500 C. Four n-type samples differing in resistivity and a p-type specimen were investigated. No apparent volatilization or recrystallization of the oxide film to produce bare metal surface was observed within the temperature range of study. Yet, changes in the nature of the oxide film occurred. The propanol adsorption increased with the activation temperature above 100 C for all the n-type samples. Acetic acid adsorbed more extensively on p-type than on all the n-type samples. The extent and energetics of adsorption were explained on the basis of the electronic properties of the samples. A mechanism of trapping of electrons by the surface Ge cations in the oxide film appears to control the adsorption of organics. (Author)

AD-257 561 Div. 25
(13 June 61) OTS price $2.60

Massachusetts U., Amherst.
THE MICROSCOPIC MEASUREMENT OF CRYSTALLIZATION RATES,
by Richard S. Stein and Joseph Powers. 8 May 61, 9p. illus. (Technical rept. no. 31)
(Contract Nonr-335700, Proj. NR 356-378)
Unclassified report

DESCRIPTORS: *Crystallization, Velocity, Measurement, Microscopy, *Thin films, Growth, *Crystals, Mathematical analysis, Corrections, Nucleation, Surfaces, *Polymers.

Relationships are discussed for determining the rates of crystallization of polymers by microscopically measuring the rate of increase of the radius of spherulites. Corrections to the equations are suggested for thin films in the following cases: (1) the absence of impingment by the surface or neighboring spherulites; (2) when impingement occurs; (3) for a truncated spherulite; (4) for 2 truncations of the same sphere; and (5) for overlapping truncations.

AD-257 569 Div. 25
(14 June 61) OTS price $1.60

California U., Los Angeles.
SOLUTIONS TO THE TWO DIMENSIONAL SPIN WAVE HAMILTONIAN,
by David I. Paul, May 61, 8p. incl. illus. tables. (Technical rept. no. 1)
(Contract Nonr 23363; Proj. NR 018-105)
Unclassified report

DESCRIPTORS: *Quantum mechanics, Atomic energy levels, Lattices, Spin, Electron transitions, Energy, *Atomic orbitals.

Some exact solutions are obtained for the Dirac spin wave Hamiltonian of a two dimensional periodic rectangular array of N atoms. Each atom in its isolated state is considered to have one outer electron which is in an s state, all other electrons being in closed shells. We show that if the number of spin waves is not greater than the number of atoms in either of the two lattice directions, exact solutions exist in which the spin waves are independent of one another except to the extent that they obey the Pauli exclusion principle. Thus, the energy eigenvalues for these particular solutions are rigorously additive and are the same as those obtained by Bloch although the number of allowed eigenstates are more restricted. (Author)

AD-257 570 Div. 25
(14 June 61) OTS price $2.60

California U., Los Angeles.
DEVELOPMENTS IN THE ENERGY BAND METHODS FOR SOLIDS, MARCH 58 - APRIL 61,
by Donald L. Bullock. May 61, 20p. incl. illus. tables (Technical rept. no. 2)
(Contract Nonr 23363)
Unclassified report

DESCRIPTORS: Electrons, *Electron transitions, Crystal structure, *Metallic crystals, Lattices, *Brillouin zones, Solid state physics, Theory, Test methods, Operators (Mathematics).

Contents:
Developments in the band theory of transition metals
Developments in the band theory of non-transition metals
Alkali metals
Polyvalent metals
Heavy metals
Semiconductors

AD-257 588 Div. 25, 26
(12 June 61) OTS price $1.60

Union Thermoelectric Corp., Chicago, Ill.
UT NEWS LETTER NO. 24.
Feb 1961. 11p. incl. illus.
(Contract DA 36-039-sc-71061)
Unclassified report

DESCRIPTORS: *Quartz crystals, Harmonic oscillators, *Quartz resonators, Crystal oscillators, Crystal holders, Manufacturing methods, Military requirements, Crystals, Single crystals, Bonding.

26. PRODUCTION AND MANAGEMENT

AD-256 935 Div. 26, 14
(2 June 61) OTS price $4.60

Forest Products Lab., Madison, Wis.
SAW PERFORMANCE AND LUMBER CHARACTERISTICS WHEN PRODUCING PULPABLE SOUTHERN PINE SAWDUST,
by F. B. Malcolm, L. H. Reineke, and H. Hallock.
Feb 61, 37p. incl. illus. tables (Rept. no. 2210)
Unclassified report

DESCRIPTORS: *Sawmills, *Circular saws, Power saws, Operation, *Wood pulp, Production, Wood pulp fibers, Tests, Processing, Manufacturing methods.

Exploratory saw performance tests were made with 12-, 18-, and 36-tooth, 48-in.-diam circular saws to observe the effect of tooth form, tooth width, saw speeds, and feed rates on the roughness and dimensional variations of the lumber and the character of the sawdust particles produced. The operating conditions shown to be most practical were used to compare the performance of the 12- and 36-tooth saws in relation to width of sawing face, sawing accuracy, acceptability of the sawdust for pulping, and planing allowance necessary to remove board surface roughness. The economics of salvaging sawdust for pulp use was compared with gains from improved sawmilling practices. There was no appreciable difference in performance between the 12- and 36-tooth saws when operated below 600 rpm and taking the same bite. Thickness variation was greater than acceptable at bites greater than 1/4 in. and depths of cut of 7 in. or more. At the 1/4-in. bite required to produce 1/4-in. chips for the pulp and paper industry, from 5/32 to 8/32 in. of added thickness was required for surfacing as compared with 4/32 in. normal in the industry. The surface degradation more than offset the kerf chip value when using the sparse-toothed saw.

AD-256 936 Div. 26
(2 June 61) OTS price $2.60

Forest Products Lab., Madison, Wis.
AN EVALUATION OF ELEVEN BIN-PALLET DESIGNS,
by T. B. Heebink. Mar 61, 10p. illus. tables
(Rept. no. 2216)
Unclassified report

DESCRIPTORS: *Containers, *Pallets, Tests, Packaging, Storage, Fruits, Vegetables, Wood.

Eleven different designs of Washington State apple bin pallets were evaluated in two weathering cycles and six rough-handling tests. The weathering cycles consisted of a water spray followed by high-temperature drying to simulate the weather in off-season outdoor storage. The rough-handling tests were planned to simulate in an accelerated manner the ordinary handling expected to occur over a long period of the life of a bin pallet in use. An analysis of the best designs, based on performance, led to the following conclusions: Vertical side and end boards, adequately fastened to horizontal framing members and diagonal braces in sides and ends, are desirable; both hardwoods and softwoods are satisfactory for bin pallet construction. (Author)

AD-256 946 Div. 26, 17, 27
(5 June 61) OTS price $9.10

Kelsey-Hayes Co., Detroit, Mich.
SURVEY AND ANALYTICAL STUDY OF THE PROJECTED STATE-OF-THE-ART IN THE USE OF HIGH STRENGTH WIRE IN FILAMENT WINDING FOR MISSILES.
7 Dec 60, 98p. incl. illus. tables.
(Subcontract to Allegany Ballistics Lab., Hercules Powder Co., Contract NOrd-16640)
Unclassified report

DESCRIPTORS: *Filament wound construction, *Rocket cases, *Pressure vessels, *Wire, Theory, Tests, Manufacturing methods, Processing, Materials, Alloys, Steel, *Steel wire, *Titanium wire, Mechanical properties, Metallurgy, Wire winding machines.

Theoretical analyses and hypotheses, and tests are presented for the determination of the adaptability and advantage of utilizing wire in rocket motor case and pressure vessel construction. A review was made of wire manufacturing and high strength and strength/weight materials were selected and tested. Steel wire had the highest strength (585,000 psi, 0.004-in. diameter) with a strength/weight of about 2 million inches; beta Ti wire had a strength/weight of 1,950,000 inches. These 2 wires approached the strength/weight of glass filaments (2 to 2.5 million inches). Tests conducted on the effect of wire handling in the processing stage of product manufacturing indicated that the loss of wire strength due to handling and spooling was not a major problem. An estimate made of the projected strength of wire over the next several years indicated steel wire outside fiber strengths of 1 million psi.

AD-257 014 Div. 26
(6 June 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
ON THE STABILITY OF ROTORS IN CYLINDRICAL JOURNAL BEARINGS,
by G. M. Rentzepis and B. Sternlicht. Technical rept. 15 May 61, 22p.
(Contract Nonr-284400, Proj. NR 097-348)
Unclassified report

DESCRIPTORS: *Bearings, *Journal bearings, *Gas bearings, Shafts, Motion, Stability, Mathematical analysis, Rotating structures, Differential equations.

The regions of stability for plane cylindrical journal bearings are determined analytically. The linear variational equation of motion was employed to obtain the stability regions bounded by families of load-carrying capacity and operating eccentricity curves. The results were applied to the quisi-static equilibrium case for gas lubricated cylindrical journal bearings L/D equals 2. They show that there exists a minimum in the stability curves, a prediction supported by experimental evidence. The results of this work seem to bridge together observation on stability at very small and large clearances. (Author)

AD-257 022 Div. 26, 8
(6 June 61) OTS price $6.60

Keystone Electronics Co., Newark, N. J.
INDUSTRIAL PREPAREDNESS STUDY ON TIGHTER TOLERANCE CR-(XM-3)/U CRYSTAL UNITS,
by James M. Ronan. Final rept. 1960, 1v.
(Contract DA36-039-sc-72691)
Unclassified report

DESCRIPTORS: *Quartz crystals, Processing, Industrial production, Industrial mobilization, Manufacturing methods, Frequency shift, X-rays, Measurement, Seals, Test equipment, Tests.

The four problem areas in the manufacture of tighter tolerance crystal units were pursued from the standpoint of establishing optimum fabricating techniques and equipment. As a result of investigation into these areas, a unique system for automatically x-raying the orientation of crystal blanks was developed; a piece of equipment was designed and developed to automatically solder crystal holder parts together by the induction heat method; and technical requirements were established for a system of temperature testing tighter tolerance crystal units. In accomplishing the above, the design objectives were met which were to establish techniques so that this type of unit could be mass-produced without severe losses, and avoid design applications that would classify it as a highly specialized type of unit. (Author)

AD-257 070 Div. 26, 31
(6 June 61) OTS price $8.10

Naval Boiler and Turbine Lab., Philadelphia, Pa.
TEST OF LORD MANUFACTURING COMPANY 380 HP NOISE ISOLATION COUPLING,
by C. H. McDowell. 5 May 61, 1v. incl. illus. tables.
(Proj. T-203)
Unclassified report

DESCRIPTORS: *Flexible couplings, Vibration isolators, Noise, Damping, Test equipment, Main propulsion plants, Vibration, Mathematical analysis, *Shaft couplings, Torque couplings, Test methods, Naval vessels, Torque, Tests, Frequency.

A noise isolation drive coupling built by the Lord Manufacturing Company was tested under static and forced vibration conditions to evaluate stiffness and damping characteristics in torsion. With coupling size and torque capacity greater than tested heretofore, a unique test rig and method for determination of characteristics was devised which permit test up to 7200 c/min with static torque imposed on the coupling of 200,000 lb - inches. This test method appears practicable for larger sized couplings and is advantageous in permitting determination of dynamic stiffness and absolute coefficients of damping in torsion under test conditions encompassing the rotational frequency range normally encountered in naval main propulsion machinery. These data should assist the accurate prediction by mathematical analysis of torsional vibration behaviour and critical frequencies of isolation mounted main propulsion machinery systems. (Author)

AD-257 119 Div. 26
(5 June 61) OTS price $9.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AUTOMATION OF MACHINE CONSTRUCTION PROCESSES, VOLUME I (Avtomatizatsiya Mashinostroitel'nykh Protessov).
21 Oct 60, 102p. incl. illus. tables, 12 refs.
(Trans. no. MCL-357 from Izdatel'stvo Akademii Nauk SSSR. Moscow, pp. 76-85, 115-125, 266-275, 280-289, 322-329, 344-347, 1959)
Unclassified report

DESCRIPTORS: USSR, *Industrial research, *Automation, Machines, Welding, Arc welding, Casting, Plastic flow, Theory, Production, *Manufacturing methods, Precision finishing,

Metals, Alloys, Steel, Aluminum alloys, Magnesium alloys, Titanium alloys, Stainless steel, Heat resistant alloys, Processing, Electric welding.

Contents:
The precision of large-size castings and methods of manufacturing them, by V. O. Yakovlev
Theory of plastic flow and some of its applications, by A. A. Il'yushin
Automatic control of resistance welding processes, by D. C. Balkovets, P. L. Chuloshnikov
Research of the Bauman Higher Technical School in Moscow on the Subject of Welding Processes, by G. A. Nikolayev
Automation of gas shielded-arc welding, by V. R. Verchenko
Automatic welding of aluminum and aluminum alloy items, by D. M. Rabkin

AD-257 133 Div. 26, 17
(5 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A TOOL FITTED WITH POWDER CERAMIC BLADES (Instrument, Osnashchennyy Mineralokeramicheskimi Plastinkami),
by S. P. Tamboytsev. 1 Nov 60, 25p. incl. illus. table (Trans. no. MCL-479 from Novosti Instrumental'noiiy Tekhniki: pp. 48-67, 1959)
Unclassified report

DESCRIPTORS: USSR, *Cutting tools, Ceramic materials, Aluminum compounds, Oxides, *Machining, Steel, Cast iron, Effectiveness, Surface properties, Copper, Brazing, Adhesives, Lathes, Industrial diamonds, Ultrasonics, Heat resistant alloys, Titanium alloys, Molybdenum, Magnesium.

The application of a new powder-ceramic tool material (based on Al oxide and designated TsM332) in metal machining is discussed. Recommended tool geometry and methods of attachment are presented as well as cutting speeds and feeds. The use of hard alloy cutting tools is discussed and compared with diamonds as a material for cutting tools. Mechanical machining of very hard materials by ultrasonics is described. The machining of Ti alloys, Mo, and Mg is discussed.

AD-257 139 Div. 26, 17
(2 June 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
FORGING AND PRESSING OF HEAT-RESISTANT ALLOYS (Kovka I Shtampovka Zharoprochnykh Splavov),
by D. I. Berezhkovskiy. 2 Nov 60, 29p. incl. illus. tables (Trans. no. MCL-547 from Metallovedeniye i Obrabotka Metallov 8:51-61, 1957)
Unclassified report

DESCRIPTORS: USSR, *Heat resistant alloys, *Forging, Nickel alloys, Cobalt alloys, Iron alloys, Chromium alloys, Processing, Heat treatment, Additives, Austenite, Martensite, Heat transfer, Thermal stresses, Grains (Metallurgy), Temperature, Pressure, Mechanical properties, Turbine blades, Compressor blades.

Metallurgical factors which influence the behavior of ingots of heat resistant alloys during forging are reviewed. These include the effects of additives to the base alloys of Fe, Ni, Co, and Cr; heat treatment; temperatures and pressures employed; vacuum melting; pouring techniques; and the size of the ingot. The optimum forging temperatures of a number of alloys are presented. Forging techniques employed by English and American factories are reviewed.

AD-257 152 Div. 26, 25
(2 June 61) OTS price $13.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRENGTH CALCULATIONS IN MACHINE CONSTRUCTION. VOLUME II. SOME PROBLEMS OF THE APPLIED THEORY OF ELASTICITY. CALCULATIONS BEYOND ELASTICITY LIMITS. CREEP CALCULATIONS (Raschety Na Prochnost' V Mashinostroyenii. Tom II. Nekotorye Zadachi Prikladnoy Teorii Uprugosti. Raschety Za Predelami Uprugosti. Raschety Na Polzuchest'),
by S. D. Ponomarev, V. L. Biderman and others. Oct 60, 187p. incl. illus. tables, 91 refs. (Trans. no. MCL-637 from Gosudarstvennoe Nauchno-Technicheskoe Izdatel'stvo Mashinostroitel'noy Literatury, Moskva:pp.487-494, 592-652, 754-812, 1958)
Unclassified report

DESCRIPTORS: *Machines, Design, Materials, Rubber, Mechanical properties, Stresses, *Elasticity, *Plasticity, Deformation, USSR, Metals, Alloys, Theory, Crystal structure, Mathematical analysis, *Creep, Pressure, *Mechanical engineering, Determination.

Contents:
Calculations of rubber and rubber-cord parts
Theory of small elasto-plastic deformations
Calculations of parts made of materials with unequal resistance to tension and compression

AD-257 154 Div. 26, 17, 30
(2 June 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TRANSACTIONS OF THE UFIMSK AVIATION INSTITUTE IM. ORDZHONIKIDZE.
Oct 60, 39p. incl. illus. tables (Trans. no. MCL-639 from Trudy Ufimskiy Aviatsionnyy Institut Im. Ordzhonikidze 3:pp. 41-62, 169-180, 1957)
Unclassified report

DESCRIPTORS: *Centrifugal fields, *Heat resistant alloys, *Quality control, Test methods, Temperature, USSR, *Steel, *Cutting tools, Vibration, Centrifuges, Design, Tests.

THE APPLICATION OF CENTRIFUGAL TESTS AT HIGH TEMPERATURES FOR MATERIAL QUALITY CONTROL AND MASS PRODUCTION CONTROL, by M. Kh. Rabinovich and O. G. Fil'tser: This paper presents the first results of a study on the use of centrifugal tests at high temperatures for the control of materials and mass production. It states the advantages of the centrifugal method: possibility of running mass tests, high sensitivity, and economy. EXPERIMENTAL STUDY OF THE PROCESS OF CUTTING STEEL WITH CUTTERS WITH A D. I. RYZHKOV CHAMFER, by A. L. Voronov: The author discusses the effect of a vibration-absorbing chamfer on the cutting temperature, on the deformation of the layer being cut, and on the chip contraction. The effectiveness of the vibration-absorbing action of the chamfer is illustrated. (Authors)

AD-257 309 Div. 26, 7
(9 June 61) OTS price $5.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
RETURNS TO SCALE IN ELECTRICITY SUPPLY,
by Marc Nerlove. 25 May 61, 53p. incl. illus. (Technical rept. no. 96)
(Contract Nonr-22550, Proj. NR-047-004)
Unclassified report

DESCRIPTORS: *Economics, *Electric power production, Power plants, Electricity, Transmission lines, Distribution, Costs, *Operations research, Management engineering, Tables.

There is evidence of a marked degree of returns to scale at the firm level. Variations in returns to scale may well be neutral in character; i.e., although the scale of operation affects the degree of returns to scale, it may not affect the marginal rates of substitution between different factors of production for given factor ratios. These conclusions derive from two conclusions of methodological interest: The appropriate model at the firm level is a statistical cost function which includes factor prices and which is uniquely related to the underlying production function; At the firm level, it is appropriate to assume a production function which allows substitution among factors of production. When a statistical cost function based on a generalized Cobb-Douglas production function is fitted to cross-section data on individual firms there is evidence of such substitution possibilities. Inadequacies in the estimation of capital costs and prices and in the treatment of transmission suggest, however, that a less aggregative approach is called for. On a less aggregative level, it may be possible to produce more adequate measures of capital and to introduce transmission explicitly. (Author)

AD-257 340 Div. 26, 17, 27
(9 June 61) OTS price $2.60

Lyon, Inc., Detroit, Mich.
DEEP DRAWN AUSFORMING DEVELOPMENT PROGRAM. 12 DIA. ROCKET MOTOR CHAMBERS,
by Wayne A. Martin. General rept. no. 1 for period ending 30 Apr 61, 23p. incl. tables.
(Contract NOw 60-0634)
Unclassified report

DESCRIPTORS: *Rocket motors, *Rocket cases, *Steel, Processing, Austenite, Heat treatment, *Drawing (Machine processing), Mechanical properties, Microstructure, Guided missiles, Materials, Manufacturing methods, Alloys, Metals.

An ausforming program was conducted to develop and apply the technique of hot-working in the austenitic phase of Tricent M-300 steel on deep drawn 1-piece 11.65-in.-diam by about 36-in.-long rocket motor chambers. An attempt will be made to include the forward dome as well as the cylindrical sidewall in an effort to achieve a uniaxial 0.2% off-set yield strength level of 400,000 psi. Twenty-five forged billets of double vacuum melted M-300 steel macro etched in 50% HCl at 160 F were suitable for the pancaking operation. Chemical analysis and metallographic examination of non-metallic inclusions and the normalized structure were made after the pancaking and normalizing operations. About 0.100 in. of material was machined from all surfaces of the pancakes to provide 25.5-in.-diam by 0.820-in.-thick blanks for the hot cupping operation. Elevated temperature tensile tests were made on the M-300 steel to determine strength and ductility in the hot austenitic condition. Examination of the fractured specimens revealed a banded microstructure of untempered martensite, intergranular free ferrite, and bainite.

AD-257 437 Div. 26, 14, 17
(12 June 61) OTS price $26.00

Lockheed Aircraft Corp., Marietta, Ga.
NON-METALLIC TOOLING FOR HIGH TEMPERATURE APPLICATIONS,
by G. E. Connell, J. L. Peters, and W. K. Fossett. Final technical engineering rept. 5 June 58-31 Dec 60. Mar 61, 487p. incl. illus. tables, 34 refs.
(Contract AF 33(600)36888)
(AMC TR 61-7-669) Unclassified report

DESCRIPTORS: *Tools, *Refractory materials, *Ceramic materials, Materials, Metals, Sheets, Molding materials, Processing, Tests, Manufacturing methods, *Machine tools.

Commercial castable refractory ceramics can now be economically fabricated into tools for hydroform blocks, draw dies, braze and heat treatment fixtures, stress relief fixtures, and stretch-form dies that will withstand operating temperatures in the 1500 - 2000 F range for use in fabrication of the newer high-temperature alloys. Many of the newer high strength - high temperature alloys require hot forming and thermal treatment tooling capable of operation at temperatures up to 2000 F, above the usefulness of plastics, kirksite, lead, etc. While hard metallic tooling such as meehanite and high nickel alloys which require machining to final dimensions, might suffice, it was felt that cast to dimension ceramic tooling would be more economical. A world wide search for potential formulations was made, resulting in the evaluation of 153 ceramic compositions. Of these, 9 have been found satisfactory for the high temperature tooling applications. Laboratory and production size tooling have been proven for up to 2000 F hydroforming and stretchforming, stress relieving, heat treating, and brazing. (Author)

AD-257 514 Div. 26, 17
(13 June 61) OTS price $12.50

Aeroprojects, Inc., West Chester, Pa.
FUNDAMENTALS OF ULTRASONIC WELDING,
by J. Byron Jones, Nicholas Haropis, and others. Final rept. on Phase 2, 1 Dec 58-1 Feb 60. Dec 60, 171p. incl. illus. tables, 45 refs.
(Research rept. no. 60-91)
(Contract NOa(s) 59-6070-c)
Unclassified report

DESCRIPTORS: *Welding, *Ultrasonics, *Photoelastic materials, Ultrasonic radiation, Photoelasticity, Stresses, Shear stresses, Welds, Aluminum alloys, Stainless steel, Copper, Aluminum, Sheets, Pressure, Energy, Heat transfer, Hardness, Plasticity, Mechanical properties, Crystal structure, Deformation.

Photoelastic investigations show that ultrasonic welds are initiated as a result of vibration-induced interfacial shear stresses combining with the interfacial shear stresses resulting from the normal clamping force to produce alternately, on the side toward which the vibratory force acts, islands of local slip within an area of elastic strain. A proper clamping force is productive of a best impedance match to effect energy delivery into the weld locale. Sheet thickness and the Vickers microhardness indentation number are combined to permit a first approximation of the energy required to produce welds between metallic sheets. Bonds are not uncommonly characterized by internal deformations without significant external deformation. The temperature achieved during vibratory welding is measured to be in the range of about 35 to 50% of the absolute melting temperature. No evidence of melting was observed in any monometallic weld. (Author)

AD-257 517 Div. 26, 17
(13 June 61) OTS price $9.10

Chromalloy Corp., West Nyack, N. Y.
EXPLOSIVE FORMING OF REFRACTORY METALS.
Final technical rept. for 30 June 59-30 Sep 60. 31 Dec 60, 1v. incl. illus. tables.
(Contract NOa(s) 59-6265-c)

Unclassified report

DESCRIPTORS: *Refractory materials, Dies, *Explosive forming, Molybdenum, Molybdenum alloys, Titanium alloys, Niobium, Sheets, Tungsten, Deformation, Microstructure, RDX, Hardness, Explosives, Physical properties, Temperature.

Explosive forming of Mo and Mo-0.5Ti alloy develops greater elongation than can be obtained by conventional forming methods. The formability of W was enhanced by increasing the strain rate, a larger percentage elongation would be obtained by the use of explosives with higher detonation velocities. Arc cast Mo-0.5Ti alloy, in contrast to pure Mo and Mo alloy produced by powder metallurgy, had improved formability when the strain rate was increased. Both the Mo and Mo-0.5Ti alloy were very susceptible to the notch effect and scratches and scribe lines must be avoided in areas where elongation of the metal is required. There was no significant variation in the hardness or microstructure between regions of slight and maximum deformation (fracture). Inclusions and pre-laminations were observed in some of the sheet materials.

AD-257 518 Div. 26, 17
(13 June 61) OTS price $18.00

Crucible Steel Co. of America, Midland, Pa.
PROCEDURES FOR PRODUCING IMPROVED TITANIUM ALLOY SHEET,
by A. E. Leach and H. A. Clampett, Jr. Final technical rept. for 27 Apr 56-1 May 60. 1 May 60, 1v. incl. illus. tables.
(Contract NOa(s) 56-995-c)

Unclassified report

DESCRIPTORS: *Titanium alloys, Aluminum alloys, Molybdenum alloys, Sheets, Tests, Tensile properties, Processing, Manufacturing methods, Vanadium alloys, Physical properties, Analysis, Design.

Over 14,000 lb of alloy sheet were produced in the solution treated condition, and distributed throughout the aircraft industry for design data collection and fabrication study. Each sheet produced was pedigreed as to its location within the ingot and mechanical property performance. These properties were analyzed statistically to provide criteria for establishing structural design information and possible specifications. Certain selected design properties were also developed. Ingot chemical homogeneity was established, and processing methods developed. Techniques for solution treating full size sheets were also developed. Most of the material produced was made by the hand sheet method. Strip processing methods were developed and a portion of the material was produced by this method. Special investigations were made on processing problems encountered during this program or on problems related to the use of these alloys by the aircraft industry. (Author)

27. PROPULSION SYSTEMS

AD-256 960 Div. 27
(5 June 61) OTS price $5.60

National Aeronautics and Space Administration, Washington, D. C.
PERFORMANCE OF BASIC XJ79-GE-1 TURBOJET ENGINE AND ITS COMPONENTS,
by Carl E. Campbell. 8 May 58, Second printing, 56p. incl. illus. tables (Research memo. no. E58C12)

Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Research memo. E58C12.

DESCRIPTORS: *Turbojet engines, Altitude chambers, Tests, Compressors, Compressor stators, Exhaust nozzles, Reynolds number, Inlet guide vanes, Gas flow, Combustion, Thrust, Fuel consumption, High altitude, Simulation, Air, Temperature.

An investigation to determine the performance of the XJ79-GE-1 turbojet engine and its components, while operating as integral parts of the engine, was conducted in an altitude test chamber. Data were obtained over a range of Reynolds number indices from 0.60 to 0.08 and for various settings of the variable compressor stators and variable-area exhaust nozzle from fully open to fully closed positions. Compressor performance and turbine performance are presented in the form of performance maps at selected values of Reynolds number index; the effects of Reynolds number on performance are summarized. The effects of variable stator angle and high inlet-air temperatures on compressor performance are also shown. Over-all engine performance (net thrust and specific fuel consumption) is presented for a flight Mach number of 0.9 at rated engine conditions over a range of altitudes to illustrate performance losses resulting from decreased Reynolds number index. (Author)

Division 27 - PROPULSION SYSTEMS

AD-257 013 Div. 27, 12, 14
(7 June 61) OTS price $1.10

High Temperature Materials, Inc., Boston, Mass.
PYROLYTIC CARBIDE DEVELOPMENT PROGRAM.
Monthly progress rept. no. 13, 1-30 Apr 61.
Apr 61, 5p. illus.
(Contract NOw 60-0292)
Unclassified report

DESCRIPTORS: Guided missiles, Surface-to-surface, *Refractory materials, *Carbides, *Rocket motor nozzles, Tantalum compounds, Hafnium compounds, Niobium compounds, Pyrolysis, Refractory coatings, Chlorides, Vapor plating, Thickness, Hardness, Crystal structure.

The processing furnace for use in coating Polaris A-3 nozzles with TaC, HfC and NbC was placed in operation. The unit performed as expected, temperature being attained with power to spare. The processing of TaC coatings on symmetric nozzles was initiated and conditions for the deposition of the stoichiometric carbide are being determined. NbC free of metal or excess C was produced as flat plate deposits. X-ray analysis showed the deposits to be face centered cubic NbC with a high degree of crystal orientation. (Author)

AD-257 087 Div. 27, 17
(5 June 61) OTS price $5.60

Budd Co., Philadelphia, Pa.
DEVELOPMENT OF HIGH PERFORMANCE ROCKET MOTOR CASE,
by H. C. Dethloff. Engineering progress rept. no. 10, 1-30 Apr 61. 30 Apr 61, 55p. incl. illus. tables.
(Contract DA 36-034-ORD-3296)
Unclassified report

DESCRIPTORS: *Rocket motors, Materials, *Steel, *Welded joints, Welding, Design, Rocket cases, Mechanical properties, Tensile properties, Tests, Test methods, Non-destructive testing, *Corrosion resistant alloys, Spot welds, *Stainless steel.

Research was continued on the development of a rocket motor case. Results on the mechanical properties, fusion welding and resistance welding of JLS 300 alloy were reported. JLS 300 steel, cold rolled and tempered to approximately 340,000 psi yield strength was T.I.G. welded using 0.032 diam. filler wire and an Argon protective atmosphere. The results of mechanical tests on tensile-shear and tension specimens are shown.

AD-257 121 Div. 27
(5 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVENTOR'S CORNER FOR CONTROL DURING OPERATION OF JET SPRAYS (Dlya Kontrolya Za Rabotoy Forsunok)
by M. Pastukhov. 21 Oct 60. 2p. (Trans. no. MCL-362 from Sovetskaya Aviatsiya: pp. 1, 30 July 59)
Unclassified report

DESCRIPTORS: *Jet engines, Jet engine nacelles, *Jet flames, *Exhaust flames, Periscopes, Optical systems, Optical equipment, Jets, Sprays, Control systems, Exhaust gases, USSR, Maintenance, Maintenance equipment.

A device for controlling the uniformity of the jet flame in an operating engine is described. It consists of a tube-periscope and a girder holding it at the rear of the nacelle. A lateral cut is made at the end of a 46 x 50 x 870 mm steel pipe opposite which a mirror is placed at a 45 degree angle. To protect it from the jet stream, the cut is enclosed in glass. The control, while the jet sprayers of the engine operate, is accomplished at a range of 5,000 to 8,000 rpm. The irregular flame of defective jet sprayers stands out sharply among the shining points of the regularly operating jet sprays. (Author)

AD-257 281 Div. 27, 10, 12
(9 June 61) OTS price $ .50

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL PERFORMANCE OF NOZZLES HAVING AREA RATIOS UP TO 300 on JP-4 FUEL - LIQUID-OXYGEN ROCKET ENGINE,
by J. Calvin Lovell and Nick E. Samanich, June 61, 17p. incl. illus. tables (Technical note D-847)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-847.

DESCRIPTORS: *Rocket motor nozzles, *Rocket motors, Conical bodies, Aerodynamic configurations, Aviation fuels, Liquid rocket propellants, Rocket oxidizers, Oxygen, Liquefied gases, Thrust, Specific impulse, *Rocket fuels, Test facilities, Design, Supersonic wind tunnels, Jet engine fuels, Configuration, Tests.

Performance tests were conducted using a nominal-4000-pound-thrust rocket engine at a chamber pressure of 600 psia. Conic nozzles with area ratios of 8 and 25 had vacuum thrust coefficients at peak specific impulse equal to the values for theoretical frozen expansion. For conic nozzles having area ratios of 50, 100, 200 and 300 the thrust coefficients were higher than those for frozen expansion and equal to approximately 95% of the equilibrium expansion values. The area-ratio-200 bell-shaped nozzles, which were 58% as long as the area-ratio-200, 15 degree half-angle conic nozzle, had thrust coefficients of 1.96, compared with 2.04 for the conic. (Author)

AD-257 282 Div. 27, 10
(9 Jun 61) OTS price $ .75

National Aeronautics and Space Administration, Washington, D. C.
RELATIONS OF COMBUSTION DEAD TIME TO ENGINE VARIABLES FOR A 20,000-POUND-THRUST GASEOUS-HYDROGEN-LIQUID-OXYGEN ROCKET ENGINE,
by Daniel I. Drain, Harold J. Schum, and Charles A. Wasserbauer. June 61, 23p. incl. illus. tables (Technical note D-851)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-851.

DESCRIPTORS: *Rocket motors, *Combustion chambers, Rocket propellants, Liquid rocket propellants, Gaseous rocket propellants,

Hydrogen, Oxygen, Liquefied gases, Rocket oxidizers, Fuel injection, Pressure, Time, Fuel injectors, Rocket fuels, Thrust, Test facilities, Frequency, High pressure research, Mathematical analysis, *Combustion.

Experiments were conducted on an uncooled 20,000-lb-thrust gaseous-H and LOX rocket engine over a range of chamber pressure from 45 to 300 psia and oxidant-fuel ratio from 2 to 7. Combustion dead times were measured and compared with dead times calculated from frequency data for two assumed combustion models. Measured combustion dead time decreased with increasing chamber pressure at constant oxidant-fuel ratio or LOX injection velocity. This dead time also decreased with oxidant-fuel ratio at constant chamber pressure or O injection velocity. For the engine model where combustion dead time was considered to be the inverse of twice the measured chamber-pressure frequency, only a fair agreement with the measured dead time was obtained. When the measured chamber-pressure frequencies were corrected for gas-dynamics effects in terms of the gas residence time, close agreement with the measured dead times was obtained. (Author)

AD-257 576 Div. 27, 12
(13 June 61) OTS price $2.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SERVICEABILITY TEST OF FLARE, IGNITING, M114,
by Kenneth A. Kartchner. Ammunitions test rept. May 61, 23p. incl. illus. tables (Rept. no. OOY-TR 61-24)
Unclassified report

DESCRIPTORS: *Flares, *Guided missiles, Surface-to-air, *Ramjet engines, Absorption, Humidity, Tests, Reliability, Test methods, Moisture, Life expectancy, Ignition.

Tests were conducted to determine the service life of the M114 igniting flare, used to ignite the ramjet engine on the Bomarc. Seventy-five flares were removed from their cans and subjected to 12 months of conditioning at varying humidity and temperatures. All 75 flares functioned normally, after the above conditioning. Additional testing revealed that flares manufactured since September 1959 were slower reacting and produced more failures compared to older flares. To verify this, 85 new flares were functioned as they were removed from the sealed shipping containers. Three of these flares failed. Twenty-nine additional new flares were subjected to high humidity and temperature for times varying from six hours to 114 hours. All flares conditioned longer than 24 hours failed to function. It was concluded that the recent change in specifications reduced the reliability of the flare and did not increase its ability to withstand moisture. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-257 271 Div. 28, 16
(9 June 61) OTS price $2.60

Naval School of Aviation Medicine, Pensacola, Fla.
THE EFFECTS OF INHALATION OF 100 PER CENT OXYGEN ON PERFORMANCE OF A TASK INVOLVING VISUAL AUDITORY CONFLICT,
by Jesse G. Harris, Jr., Dietrich E. Beischer, and Dale Everson. 5 Oct 60, 20p. incl. illus. tables. (Rept. no. 3)
(Proj. MR005.13-1002)
Unclassified report

DESCRIPTORS: *Oxygen, *Respiration, Psychomotor tests, Physiology, Brain, Naval personnel, Stimulation, *Auditory perception, *Visual perception, *Reaction (Psychology).

Conflicting and similar visual and auditory stimuli were presented in a random manner to a group of 9 subjects inhaling 100% oxygen for three and one-half hours, and the results compared with a group of 40 control subjects breathing air. Statistical and graphic evaluation led to the conclusion that 100% oxygen probably has no effect on performance of this task. If it does have an effect, it is at most a barely detectable one. There are no indications of gross disorganization, marked retardation, or of failure to follow instructions under the influence of pure oxygen. (Author)

AD-257 277 Div. 28
(9 June 61) OTS price $1.10

Naval School of Aviation Medicine, Pensacola, Fla.
EVALUATION OF TWO FORCED-CHOICE FORMATS,
by Lawrence K. Waters and Robert J. Wherry, Jr. 15 Feb 61, 5p. incl. tables (Rept. no. 10)
(Proj. no. MR005.13-5001)
Unclassified report

DESCRIPTORS: *Aviation personnel, Naval personnel, Selection, Personality tests, Psychology, *Military psychology.

The reactions of a sample of flight candidates in the U.S. Naval School, Pre-Flight were used to investigate the effect of response format on subject resistance to a forced-choice self-rating scale. The results indicated that the subjects were more favorable toward a response format allowing them to indicate the degree of applicability of each statement in pairs, even though still forced to choose one statement as relatively more applicable. (Author)

AD-257 325 Div. 28, 32
(9 June 61) OTS price $5.60

Bureau of Social Science Research, Inc., Washington, D. C.
CULTURAL MODELS OF CAPTIVITY RELATIONSHIPS,
by Albert D. Biderman. Feb 61, 52p. (BSSR research rept. no. 339-4)
(Contract AF 49(638)727)
(AFOSR-452)
Unclassified report

DESCRIPTORS: *War prisoners, Sociology, *Behavior, Culture, Social communication, Social sciences, Korea, *Stress (Psychology), *Adjustment (Psychology).

The behavior of captives is in large measure dependent upon their conceptions of what social roles are appropriate to the unfamiliar situations they encounter. These situations are also shaped in important ways by cultural conceptions of the

captor regarding the status of his captives. The present report reviews some of the historical and traditional elements of the cultures of captor and captives that have important direct effects on these role conceptions. Some possible implications of the discussion for the training of armed forces personnel for the event of capture are indicated. The report was prepared as part of a critical review of studies of prisoners of war, concentration camp prisoners, and political prisoners. The study examined the relevance of this literature for the social sciences. The emphasis in the present report, as in the larger study, was on works dealing with the Korean war. (Author)

AD-257 361 Div. 28, 31
(12 June 61) OTS price $1.60

Electric Boat Div., General Dynamics Corp., Groton, Conn.
PROJECT SUBIC. SHIP CONTROL XII. AN EMPIRICAL EVALUATION OF QUICKENING IN A CONTACT ANALOG DISPLAY,
by Dean W. Plath and Wesley C. Blair. 27 Oct 60, 7p. incl. illus. tables (SPD 60-131)
(Contract NOnr-251200)
Unclassified report

DESCRIPTORS: *Submarines, Control systems, Automatic, Display systems, Simulation, Submarine personnel, Analog systems, *Submarine simulators, Training, Training devices, Analog computers.

The objective of this study was to determine the effect on operator performance of the addition of quickened information to a Contact Analog Display. Two independent groups of five inexperienced male subjects were required to seek and keep course and depth simultaneously in the Electric Boat Division Submarine Simulator programmed with SKIPJACK 20-knot equations. Each group was tested on one of two ship control displays: (1) A quickened course and depth display, and (2) a quickened course and depth display superimposed on a two-surface Contact Analog display which included a roadway director and an artificial horizon. Time on ordered depth, on course, and on both were recorded simultaneously. Scores obtained by each group were compared with each other and with scores obtained in an earlier experiment with an unquickened Contact Analog-roadway display. (Author)

AD-257 363 Div. 28, 32
(12 June 61) OTS price $7.60

California U., Los Angeles.
THE EFFECTS OF TRAINING ON WORD ASSOCIATION ORIGINALITY AND UNUSUAL USES,
by Seymore Simon. Technical rept. no. 7 on The Training of Original Problem Solving Behavior. Mar 61, 136p. incl. illus. tables, 67 refs.
(Contract Nonr-23350)
Unclassified report

DESCRIPTORS: *Training, Behavior, Learning, *Verbal behavior, Statistical analysis, Vocabulary, *Reaction (Psychology), Tests.

Number of words and number of repetitions were systematically varied in a 4x4 factorial design and the effects of this differential training on free association and unusual uses originality performances were studied. Results indicated that no siginificant trend developed as a function of manipulating the 2 independent variables. Number of words, failed to facilitate the production of uncommon responses both in training and in testing. Analysis of the repetition dimension showed that the groups receiving 8 repetitions of training were significantly more original than the control group on the free association test list, and significantly better than the 2-repetition groups on the unusual uses test. Both the training and test data suggest that, had a more homogeneous sample been obtained, this repetition variable would have yielded significant criterion trends. All of the correlations between the training and testing measures were highly significant and in the predicted directions. (Author)

AD-257 428 Div. 28, 23
(12 June 61) OTS price $1.10

Illinois U., Urbana.
EQUIPERCENTILE CONVERSIONS AS A FUNCTION OF TRAINING IN A TECHNICAL CURRICULUM,
by Lloyd G. Humphreys. Dec 60, 5p.
(Contract AF 41(657)279)
(WADD TN 60-265)
Unclassified report

DESCRIPTORS: Training, Tests, *Achievement tests, *Aptitude tests, *Intelligence tests, Reliability, Statistical analysis, *Psychometrics.

This study examines the effect of training differences on scaling new forms of personnel tests for equivalence to previous forms. Three classes of a technical high school were given the test against which Air Force classification tests have been scaled, the General Classification Test. In addition, they took a recent form of the Airman Classification Battery. The ability range of these students corresponded closely to that of the airman population, showing that findings from these samples can be generalized to the Air Force input. Differences between sophomores and seniors in equipercentile conversion tables for the aptitude indexes reflected the emphasis in this high school on mechanical training. This was interpreted as a joint effect of the nature of the tests and the nature of this particular high school curriculum. (Author)

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-257 093 Div. 29
(6 June 61) OTS price $2.60

Frankford Arsenal, Philadelphia, Pa.
EVALUATION OF DEVELOPMENT SAMPLES OF SIX NON-MAINTAINABLE ARMY WRIST WATCHES,
by D. Marcello and W. T. Abell. 15 May 61, 26p. incl. illus. tables (Test rept. no. T61-6-1)
(Proj. 5W13-07-010)
Unclassified report

DESCRIPTORS: *Wrist watches, Tests.

The savings available thru elimination of field maintenance of Army wrist watches are discussed. USCONARC field performance requirements and the laboratory test requirements established as a

control for procuring watches to meet the field requirement are reviewed. The results of laboratory test on lots of ten each of a non jeweled watch, a 1 jeweled watch, two 7 jeweled watches, a 7 jeweled watch with a self regulating feature and a 17 jeweled watch are presented. The quantitative test data is presented in the form of tables covering average daily rate error, standard deviation of rate errors, poise, isochronism, difference between individual rate readings and their mean, change in rate with temperature and the change in these parameters after exposure of the watches to magnetic fields, shock, vibration and high and low temperature. It is concluded that the 7 jeweled watches and possibly the 2 jeweled watch should meet the USCONARC field performance requirement. (Author)

AD-257 337 Div. 29
(9 June 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF TENT, AVIATION MAINTENANCE, SMALL, ADJUSTABLE FOR FIXED-WING AIRCRAFT T59-1.
18 May 61, 5p. illus.
(Proj. ATB 4-81)
Unclassified report

DESCRIPTORS: *Tents, Arctic regions, Tests, *Shelters, Maintenance, *Aircraft.

Service tests were made to determine the suitability of the Tent, Aviation Maintenance, Small, Adjustable, for Fixed-Wing Aircraft, T59-1 for Army use under arctic winter conditions. Because the test tent would not house the H-34 tail rotor or provide sufficient work space for the engine, consideration should be given to development of a larger type organizational maintenance shelter. The aluminum ground anchor supplied with the test tent is not suitable for arctic use. Consideration must be given to development of a ground anchor that can be used in frozen ground. It is concluded that the tent is unsuitable for Army use under arctic winter conditions. (Author)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-256 903 Div. 30
(2 June 61) OTS price $1.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
A THEORY OF ADAPTIVE SYSTEMS. I. A LOGICAL THEORY OF ADAPTIVE SYSTEMS INFORMALLY DESCRIBED (PRECIS)
by J. H. Holland. Quarterly progress rept. no. 1, 1 Nov 60-31 Jan 61. May 61, 10p. (Rept. no. 04274-1-P)
(Contract DA 36-039-sc-87174)
Unclassified report

DESCRIPTORS: Automation, Theory, *Computers, Automatic, *Programming, Cybernetics.

A theory of machine adaptive systems is developed within the framework of the theory of growing automata. Iterative circuit computers composed of iterated modules (which contain logic and delay elements) arranged in geometric arrays are discussed. The adaptive system theory is presented in four stages. (1) The basis (the iterative circuit computers briefly described above); (2) the generation of automata in the geometric space of iterative circuit computers; (3) interaction of automata embedded in the space along with ranges of environments also embedded in the space; and (4) evaluation and accumulation of methods and adaptations. (Author)

AD-257 030 Div. 30, 2
(8 June 61) OTS price $1.60

Kem-Tech Labs., Inc., Baton Rouge, La.
MOBILE CHEMO SENSING AND ANALYTICAL LABORATORY
1961, 11p. incl. illus.
(Contract AF 30(602)2255; Proj. 5999)
(RADC TR 61-59) Unclassified report

DESCRIPTORS: Laboratory equipment, Transportation, Mobile, Test facilities, Test equipment, *Air, *Atmosphere, Analysis, Gases, Radioactivity, Spectrophotometers, Spectrographic analysis, Specifications, Military requirements, *Laboratories, Sampling.

The design, equipment, and installation of this unit are discussed. The laboratory provides facilities for routine laboratory and atmospheric sampling analysis. The unit is housed in a Ford F-600 chassis and cab. The equipment includes a centrifuge, a polarizing light microscope, a muffle furnace, a Beckman zeromatic pH meter, a Beckman model B spectrophotometer, a Barnstead ion exchange water purifier, an analytical balance, 3 dry test meters, 2 vacuum pumps, a water storage tank, an air compressor, and one air sampling system.

AD-257 056 Div. 30, 14
(5 June 61) OTS price $1.60

Rubber Lab., Mare Island Naval Shipyard, Vallejo, Calif.
COMPARISON OF TEST PROCEDURES FOR THE EVALUATION OF DAMPING TREATMENTS,
by R. R. James. 31 May 61, 4p. illus. (Rept. no. 94-28)
Unclassified report

DESCRIPTORS: Test methods, *Test facilities, Metal plates, Vibration, Damping, Beams, Steel, Acoustic insulation, Instrumentation, *Insulating materials, Vibration isolators, Measurement, Frequency, Disks, Tests, Rods.

An investigation of the disk method and bar method for evaluation of damping treatments was undertaken to determine whether differences in test results obtained by the two methods of test were inherent in the method of test or were due to variation in sample material. Tests performed on ML-D2 damping treatment showed that the disk method gave higher damping at frequencies up to about 6 kc. This difference was attributed to edge effects which are stronger in the disk method of test. At frequences above about 6 kc, inconsistencies in the data were so large that differences due to test method could not be separated. (Author)

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-257 076 Div. 30, 2, 25
(7 June 61) OTS price $3.60

Woods Hole Oceanographic Institution, Mass.
MARINE METEOROLOGY. MEASUREMENTS OF RADIATIVE FLUX AND COOLING OVER THE OCEAN EAST OF TRINIDAD,
by David B. Clarke. Apr 61. 1v. incl. illus. tables (Ref. no. 61-14; Technical rept. no. 46)
(Contract Nonr-172100)
Unclassified report

DESCRIPTORS: *Atlantic Ocean, *Radiometers, *Marine meteorology, Tables, Measurement, Atmosphere, *Thermal radiation, *Infrared radiation, Instrumentation.

An improved version of an airborne radiometer is described. Six flights over the Atlantic Ocean east of Trinidad were made with it during November 1959. Measurements of the radiative flux and cooling between 100 and 15,000 feet are presented. A heat budget is constructed for the sub-cloud layer. (Author)

AD-257 090 Div. 30, 2, 25
(5 June 61) OTS price $2.60

Institute for Advanced Studies, Dublin (Eire).
(No title)
by L. W. Pollak. Summary rept. 31 Aug 60. 21p. incl. table.
(Contract AF 61(052)26)
(AFCRL-614) Unclassified report

DESCRIPTORS: *Condensation, Freezing, *Counting methods, Ice fog, Fog, Ice, Instrumentation, Gas flow, Condensation reactions, Photoelectric cells, Drops, Cloud chambers.

Equipment and methods for counting condensation nuclei and for measuring their size have been perfected. The relative photo-electric nucleus counter has been calibrated under laboratory conditions by means of the absolute stereo-photographic nucleus counter. The influence of pressure and temperature on the counting of nuclei has been studied. The effect of various processes taking place in the fog of a photo-electric counter during its operation has been studied. The properties of atmospheric freezing and sea-salt nuclei have been investigated under maritime conditions at the west coast of Ireland. (Author)

AD-257 094 Div. 30, 20
(5 June 61) OTS price $1.10

Israel Inst. of Tech., Haifa.
PULSE HEIGHT INDICATOR,
by U. Galil and D. Ophir. 23 Feb 60. 4p. illus. (Technical note no. 1)
(Contract AF 61(052)196)
(AFCRL TN 60-438) Unclassified report

DESCRIPTORS: *Pulse height analyzers, Transistors, Pulse discriminators, Pulse analyzers, Digital systems, Measurement, *Data storage systems, Electronic circuits, Pulse integration, *Pulse counters, Cosmic rays, Israel, Technological intelligence, Geiger counters.

A method is described which was developed for the analysis of pulses produced by the various detectors of an extensive air shower array. It is applicable to many other experiments whenever the need arises for the determination of instantaneous pulse heights at the times of occurrence of certain physical phenomena. An application of digital methods is presented for pulse measurement, which was found very satisfactory where some 25 sources of information had to be analyzed in 16 amplitude channels each. The display consists of dekatrons, where each dekatron (in conjunction with one neon bulb) represents one source of information and the amplitude channel is given by the reading of the dekatron (the neon lamp supplies the information if the number on the dekatron is below or above 10). (Author)

AD-257 105 Div. 30, 2
(5 June 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GRAVIMETRY AND GRAVIMETRIC PROSPECTING
(Gravimetriya I Gravimetricheskaya Razvedka),
by V. A. Sorokin. Oct 60. 35p. incl. illus. tables. (Trans. no. MCL-11 from Moscow:185-203, 1951)
Unclassified report

DESCRIPTORS: *Geophysical prospecting, *Gravity, *Instrumentation, Measurement.

AD-257 165 Div. 30, 17, 26
(2 June 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETECTION OF FINE CRACKS IN METALS.
21 Dec 60. 6p. incl. illus. tables. (Trans. no. MCL-786 from Bedrijf en Techneik 195:1-2, 30 Jan 54)
Unclassified report

DESCRIPTORS: USSR, Metals, *Non-destructive testing, Fracture (Mechanics), Quality control, Test methods, Ink, Penetration, Dyes, Alloys, Detection.

The sensitivity of the Met-L-Chek method for the testing of metals for surface cracks by the penetration of a red ink or dye by capilliary action was compared with that of the magnetic iron-powder method. The method is not restricted to magnetic materials and can often be applied without disassembly of the component part. Complicated test equipment and especially trained technicians are not required for its application.

AD-257 179 Div. 30
(6 June 61) OTS price $1.60

Lund U. (Sweden).
DESIGN, CONSTRUCTION AND TESTING OF A HEAT OF VAPORIZATION CALORIMETER USEFUL IN THE VAPOR PRESSURE RANGE 1 TO 0.01 mm HG AT 25 C,
by Stig Sunner. Final technical rept. no. 1, 1 Apr 60-1 Apr 61. 25 Apr 61. 12p. incl. illus.
(Contract DA 91-591-EUC-1423)
Unclassified report

DESCRIPTORS: *Calorimeters, *Vaporization, Vapor pressure, Design, Tests.

The development of a method for determination of heat of vaporization at 25 C of substances exerting a vapor pressure in the range 1 to 0.001 mm Hg started out from the carrier-gas method worked out by Dr. I. Wadso of this laboratory for substances with vapor pressures between 100 and 1 mm Hg (Acta Chem. Scand. 14(1960), 566). In the preliminary investigations it was found that expected variations in back-ground effects due to thermal changes in the carrier-gas during the passage through the evaporation chamber would cause serious difficulties in the low pressure region. This technique was therefore abandoned and, in the next step, different types of large-orifice evaporation chambers were investigated. The results were felt to be promising and a preliminary apparatus was constructed and tested. From the experience gained the design was changed and a calorimeter system has recently been completed which is believed to be of a close to final design. So far, only a few tests have been performed, mainly of a technique for introducing samples and thermal stability. (Author)

AD-257 180 Div. 30, 25
(5 June 61) OTS price $4.60

Lockheed Electronics Co., Plainfield, N. J.
LOW-LEVEL VIBRATION-MEASUREMENT FEASIBILITY STUDY.
Final rept. 31 Dec 60, 1v. incl. illus.
(Contract NObs-78793)
Unclassified report

DESCRIPTORS: *Vibration, Measurement, Test equipment, Test methods, Accelerometers, Sensitivity, Frequency, Amplifiers, Signal to noise ratio, Piezoelectric transducers, Theory, Tests.

Research was conducted to determine the feasibility of using piezoelectric type accelerometers, coupled to electronic integrating networks, for measurement of vibration velocities corresponding to minimum accelerations of 0.0002 g over a frequency range of 10 c to 10 kc. Tests were conducted with a commercial accelerometer operating in conjunction with a new design of amplifier having the lowest noise level presently achievable in the state-of-the-art. The spectrum of the noise was measured, and the sensitivity of the accelerometer-amplifier combination was determined. It was found that accelerations of 0.0002 g could be measured with good S/N ratio over the entire frequency range of interest. However, integration of the output to obtain velocities yielded useable S/N's only at the lower end of the spectrum. This resulted from the low-frequency peak in the noise spectrum combined with the -6 db per octave slope of the integrating network. It is concluded that peizoelectric accelerometers are not feasible for measurement of vibration velocities down to the minimum levels of interest. (Author)

AD-257 286 Div. 30, 15, 32
(9 June 61) OTS price $2.60

Rand Corp., Santa Monica, Calif.
ON THE VALUE OF A DEPENDENCY CONNECTION,
by David G. Hays. 20 Jan 61, 21p. incl. illus.
(Rept. no. RM-2712-AFOSR)
(Contract AF 49(638)737, Proj. 9769)
(AFOSR-150) Unclassified report

DESCRIPTORS: *Machine translation, Vocabulary, *Language, *Data processing systems, *Coding, Mathematical analysis.

In sentence-structure determination, values are tentatively defined as numbers assigned to types of syntactic relations in such a way that connections of higher value are established in preference to connections of lower value. For a text in which sentence structures are known, the values of some syntactic relations can be estimated by the following plan: assign value 1 to a relation provided no relation is known to have lower value; assign value 2 to a relation provided all relations known to have lower value are also known to have value 1; etc. The same procedure can be used for assigning adjectives to order classes, and for other similar purposes. (Author)

AD-257 287 Div. 30, 32
(9 June 61) OTS price $2.60

Rand Corp., Santa Monica, Calif.
PROCEDURES FOR THE DETERMINATION OF DISTRIBUTIONAL CLASSES,
by Kenneth E. Harper. 23 Jan 61, 19p. incl. table
(Rept. no. RM-2713-AFOSR)
(Contract AF 49(638)737, Proj. 9769)
(AFOSR-149) Unclassified report

DESCRIPTORS: *Machine translation, Data processing systems, Automatic, *Language, Digital computers, Vocabulary, Analysis, Coding, Distribution, Classification.

AD-257 307 Div. 30, 32
(9 June 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION,
by A. E. Brain, A. B. Novikoff, and C. P. Bourne.
Quarterly progress rept. no. 4, 1 Jan-31 Mar 61, Apr 61 40p. incl. illus. tables.
(Contract DA 36-039-sc-78343, Proj. 3A99-22-001-02) Unclassified report

DESCRIPTORS: *Data processing systems, Military requirements, *Documentation, *Identification systems, Aerial photographs, Video networks, Data storage systems, *Military research, Analytic geometry, Integrals.

A small pattern-recognition machine is being constructed capable of modification to various schemes of logic. A discussion is presented of some factors affecting the selection of machine design constants. When the pertinent limitations are imposed on the adjustable parameters, the freedom for arbitrary choice becomes very small. Fortunately, preliminary experimental results indicates that the design is practical and apparently free from mutually incompatible boundary conditions. A method is described for sampling the retina in a manner which is no longer random, but achieves a uniform distribution of probability by a specific system of selection. The results of some preliminary tests demonstrate the ability of the machine to discriminate in an environment of superimposed conflicting data. The mathematical investigation of certain theorems of integral geometry continues, and a discussion is presented of the manner in which size-invariant parameters may be constructed.

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-257 310 Div. 30, 4, 25
(8 June 61) OTS price $1.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
A GAS CHROMATOGRAPHY VALVE FOR VACUUM SAMPLING OF GASES,
by H. L. Friedman. Mar 61, 5p. illus. (TIS rept. no. R61SD052)
(Contract AF 04(647)269)
Unclassified report

DESCRIPTORS: *Gases, *Chromatographic analysis, Instrumentation, Copper tubing, Valves, Design, *Vacuum systems.

The design, construction details, and technique of operation is presented for a valve assembly which may be used to inject gas samples from a vacuum system into a gas chromatograph. (Author)

AD-257 335 Div. 30
(8 June 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
THE COMPUTER DATA FORMAT TRANSLATOR,
by Robert Goldsteen. May 61, 25p. incl. illus. tables (Rept. no. 1467)
Unclassified report

DESCRIPTORS: *Computers, *Instruction manuals, *Machine translation, Magnetic tape, Data processing systems.

This report serves as an introduction to the Computer Data Format Translator. The CDFT performs three basic types of information translations: computer tape to computer tape, analog to computer format, and straight binary to computer format. Computer format is the format of either Univac or IBM. The variations of each translation which provide the 14 major operation modes of the unit are discussed. The principles of operation and sample patch board connections are given. Detailed block layouts and output tape formats have been provided for the reader to follow the path of the data through the system. (Author)

AD-257 380 Div. 30
(12 June 61) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
A FORCED-OSCILLATION BALANCE SYSTEM FOR THE von KARMAN FACILITY 40- BY 40-INCH SUPERSONIC TUNNEL,
by C. J. Welsh, Q. P. Hance, and L. K. Ward. May 61, 19p. incl. illus. (AEDC TN 61-63)
(Contract AF 40(600)800, Proj. 8952)
Unclassified report

DESCRIPTORS: *Supersonic wind tunnels, *Reentry vehicles, Recording devices, Yaw, Measurement, Damping, Electronic systems, Tests, Vibration mechanisms, Pitch, *Aerodynamic configurations, Balances, Model tests, Test methods, Operation, Control systems.

A description of a recently developed, forced-oscillation balance system for the von Karman Gas Dynamics Facility's 40- by 40-inch supersonic wind tunnel is given. Measured damping-in-pitch derivatives for a flared afterbody reentry shape at free stream Mach number 4 over a Reynolds number range from 0.37 x 10 to the 6th power to 0.58 x 10 to the 6th power based on body diameter are presented. (Author)

AD-257 419 Div. 30, 15
(12 June 61) OTS price $10.50

Advanced Electronics Center, General Electric Co., Ithaca, N. Y.
CODING AND DECODING OPERATIONS RESEARCH. VOLUME 1,
by M. Mitchell, C. Burton and others. Final rept., vol. 1. 14 Jan 61, 1v. incl. illus. 84 refs.
(Contract AF 19(604)6183)
(AFCRL-8, vol. 1) Unclassified report

DESCRIPTORS: *Coding, Operations research, *Data processing systems, *Matrix algebra, Errors, Sequences, Data transmission systems.

This report includes:
CODING AND DECODING OPERATIONS RESEARCH. PART 1. SUMMARY, by M. Mitchell, C. Burton and others. Final rept., pt 1. 14 Jan 61, 13p.
(Contract AF 19(604)6183)
(AFCRL-8, vol. 1, pt. 1)

CODING AND DECODING OPERATIONS RESEARCH. PART 2. SINGLE-STAGE DECODING OF CERTAIN CYCLIC ERROR-CORRECTING CODES, by M. Mitchell and C. Burton. Final rept. on part 2. 14 Jan 61, 112p. incl. illus.
(Contract AF 19(604)6183)
(AFCRL-8, vol. 1, pt. 2)

AD-257 462 Div. 30, 4
(12 June 61) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
POLAROGRAPHY,
by Gerald C. Whitnack. Apr 61, 10p. incl. illus. table (NOTS TP 2566; Technical article no. 11)
Unclassified report

DESCRIPTORS: *Polarographic analysis, Theory, Instrumentation, Mercury electrodes, Test methods, Recording devices, Cathode ray tube screens, Polarization, Electrolysis, Cathodes (Electrolytic cells).

Polarography, a relatively new, highly important tool of analytical chemistry, is based on the fact that the current obtained by subjecting a solution in a cell to a potential between a polarized and a nonpolarized electrode is a function of the concentration of the reacting substance and the voltage necessary to produce a reaction at the electrodes. Chemical traces as small as one part in 100 million can be analyzed by polarography. New techniques, including the use of cathode-ray polarographs, permit very rapid analysis of even complex mixtures. Polarography has broad applications in many frontier areas of science, including oceanography, rocketry, biochemistry, and chemical synthesis. (Author)

AD-257 527 Div. 30, 5
(13 June 61) OTS price $1.10

Air Force Cambridge Research Center, Bedford, Mass.
THE USE OF DIGITAL COMPUTERS IN SPEECH ANALYSIS

AND SYNTHESIS,
by C. P. Smith. Nov 59, 6p. illus. (AFCRC TN 59-958)
(Proj. 4610)

Unclassified report

DESCRIPTORS: *Digital systems, Data processing systems, *Speech representation, *Speech transmission, *Voice communication systems, Speech, Reduction.

A new approach toward the goal of compressed digital speech communication is based on speech data reduction in successive stages. First, the voice signal is measured in a Vocoder type of analyzer and the output information digitized. The spectrum pattern data is then reduced by selecting the best approximations from a stored set of spectrum patterns, and reading out the pattern serial numbers. This data is further reduced by selection of the best approximations from a stored set of pattern sequences and pitch sequences. The serial numbers of the sequences are transmitted. At the receiver, an inverse process expands the information to a voice output. (Author)

AD-257 582 Div. 30, 8
(13 June 61) OTS price $3.60

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
POWER DENSITY MEASUREMENT TECHNIQUES,
by Ernest Jacobs, Nabil Farhat and Robert A. Leavenworth. Quarterly progress rept. no. 2, 1 Jan 61-31 Mar 61. 30 Apr 61, 1v. incl. illus. tables (Rept. no. 61-16)
(Contract DA 36-039-sc-85177)

Unclassified report

DESCRIPTORS: *Radiofrequency power, Test methods, Crystal rectifiers, Hall effect, Design, Transducers, Antennas, Microwaves, Radiation hazards, Radio waves, Crystal detectors, Electromagnetic fields, *Power meters, Measurement.

Research was continued on methods of measuring power density primarily from the viewpoint of obtaining hazard information. The block diagram of the functional procedures needed to measure power density was developed. The specific power density measuring system using an antenna to sample the field and a crystal detector to convert the RF signal to a measurable quantity is considered. The relationship between power density and meter indication of this system is the product of 2 factors that are relatively independent of each other. These factors are called front-end and back-end transformation ratios. It was decided to obtain the back-end ratio experimentally. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-256 901 Div. 31, 10, 13, 33
(2 June 61) OTS price $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
TECHNIQUES OF INSTALLATION FOR THE 4-INCH BOTTOM LAID SYSTEM (SHIP-TO-SHORE BULK FUEL DELIVERY)
by J. J. Traffalis. 19 Apr 61, 36p. incl. illus.
(Technical note no. N-408)
(Proj. Y-F015-05-302)

Unclassified report

DESCRIPTORS: *Fuel hose, *Pipes, Installation, Underwater telephones, Design, Trailers, Barges, Ship telephone systems, Underwater equipment, Fuel pumps, Operation, Maintenance, Refueling pumps, Refueling at sea.

Recommended techniques are given for installing and operating the 4-inch Bottom Laid System (Ship-to-Shore Bulk Fuel Delivery) in an amphibious operation. Described are the general features and limitations of the System, including its equipment, layout, installation, operation, and shipping requirements. (Author)

AD-257 327 Div. 31, 12
(9 June 61) OTS price $4.60

Naval Weapons Lab., Dahlgren, Va.
TALOS STRUCTURAL FIRING TEST ABOARD THE USS LITTLE ROCK (CLG-4),
by J. W. Loving, T. I. Dodson, and others.
11 May 61, 1v. incl. illus. tables (NWL rept. no. 1751)

Unclassified report

DESCRIPTORS: *Guided missiles, Surface to air, Launching, Shipborne, *Naval vessels, Cruisers, Blast, Guided missile boosters, Explosion damage, Guided missile personnel, Shelters, Design, Ship bulkheads, Ship decks, Tests, Measurement, Guided missile launchers, Exhaust gases, Exhaust flames.

Six TALOS Mk 11 Mod 2 boosters with concrete slugs were fired aboard the USS LITTLE ROCK (CLG-4) to investigate the adequacy of the protection for the TALOS launching system personnel against blast effects and to determine the effects of the booster blast on the ship's structure. The test vehicles were fired at various angles such that the exhaust stream was directed at areas where damage, flame, or toxic gas leakage had occurred during the structural firing tests aboard the USS GALVESTON (CLG-3). These tests were also utilized to evaluate the design changes in the ship's structural components that were necessitated by the results of the GALVESTON tests. Measurements were made of pressures in the exhaust stream, structural strains, toxic gas concentrations, noise levels, flame penetrations at door seals and temperature changes inside the ship. High-speed motion pictures were taken on all tests. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-256 932 Div. 32, 11
(2 June 61) OTS price $2.60

Forest Products Lab., Madison, Wis.
LOG DIMENSIONS AND THE SELECTION OF EQUIPMENT,
by A. Chardin, Cl. Lepitre and others. Rept. for Improved Harvesting Methods. Equipment Survey Notes. Mar 61, 20p. illus. tables (Rept. no. 1637-59; Trans. from Bois et Forets des Tropiques, May-June 59.)

Unclassified report

DESCRIPTORS: *Wood, *Forestry, Distribution, *Trees, Sawmills, Handling, Test equipment, Tractors, Fork lift vehicles.

Division 33 - TRANSPORTATION

AD-257 155 Div. 32
(2 June 61) OTS price $9.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INDEX OF STATE STANDARDS FOR 1958 (SELECTED PARTS) (Ukazatel' Gosudarstvennykh Standardtov 1958). Feb 61, 111p. (Trans. no. MCL-653 from Standartgiz Moscow;pp. 177-199, 203-227, 247-252, 271-299, 397-398, 1958)
Unclassified report

DESCRIPTORS: *Indexes, *USSR, Standards, Transportation, Containers, Electric power production, Electric machinery, Electrical engineering, Ceramic materials, Silicates, Chemicals, Rubber, Asbestos fiber, Vocabulary.

Contents:
D. Means of transportation and containers
E. Electrical power and electrical engineering equipment
I. Silicate-ceramic materials and products
L. Chemical products and rubber-asbestos products
T. Scientific and technical terms, symbols, and quantities

AD-257 288 Div. 32, 30
(9 June 61) OTS price $1.60

Rand Corp., Santa Monica, Calif.
TRANSFORMATIONAL CRITERIA FOR THE CLASSIFICATION OF PREDICATIVE GENITIVE CONSTRUCTIONS IN RUSSIAN, by Dean S. Worth. 24 Jan 61, 15p. (Rept. no. RM-2714-AFOSR)
(Contract AF 49(638)737, Proj. 9769)
(AFOSR-148) Unclassified report

DESCRIPTORS: *Machine translation, Theory, Language, Classification, USSR.

A major advantage of the transformational approach to syntactic structure is that the investigator is no longer bound to the low levels of generality inherent in the morphological detail of actual sentences. Instead, he can regard syntax as a dynamic, addressor-oriented process, the units of which form a hierarchy of functional abstractions. This conception is illustrated by an analysis of Russian constructions containing genitive substantives that must be modified by another unit, although the exact form (adjective or substantive) of this second unit is irrelevant. The transformationally determined varieties of such constructions are cataloged, and it is shown that all such constructions contain either an actual or an implied predication. (Author)

AD-257 575 Div. 32
(13 June 61) OTS price $1.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
DOCUMENT GROUPING.
by John O'Connor. 1960, 13p.
(Contract Nonr-55135)
Unclassified report

DESCRIPTORS: *Documentation, Data processing systems, Automation, *Indexes, Coding, Punched card methods.

Document grouping is a scheme whereby a grouping is made of certain serial numbers given documents within a coordinately indexed collection along with the index terms assigned to those documents. By then assigning a group number to these selected serial numbers, they may be stored as a group. Such grouping might permit reductions in storage and in searching time when used in some kinds of coordinate retrieval systems. The set of document group numbers resulting from such a search may be further perused for indexing terms by the use of a card catalog, a book which lists serial numbers and index terms, or directly in a file of documents. In the last case, each document group can be preceded by a guide sheet in scan column format. Document grouping is applicable to punch-card sorting systems, peek-a-boo cards, and the scan column index. False drops resulting from document grouping are discussed in detail. The scan column index is summarily described: It is usually in book form, each document being represented by a horizontal line on the page on which are placed the serial number of the document along with abbreviations for the terms from the indexing vocabulary. (Prepared for presentation at the Meeting in Miniature of The American Documentation Institute in Philadelphia, Feb. 10-11, 1961).

33. TRANSPORTATION

No Entries

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

ASTRONOMY

PB 154 780 $5.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
CROSS SECTION FOR DISSOCIATIVE RECOMBINATION OF NITRIC OXIDE, by B. E. Squires, Jr. Scientific rept. no. 144 on Ionospheric Research, Contract AF 19(604)4563. 1 Jan 61, 56p. 15 refs. AFCRL-242; AD-251 129.

DESCRIPTORS: *Nitrogen compounds, *Oxides, *Recombination reactions, Ions, Molecules, *Ionosphere, Electrons, Perturbation theory, Quantum mechanics.

An attempt is made to set up a model for the calculation of the cross section for dissociative recombination of NO+, namely the reaction NO pos. + e neg. yields N + O. In this reaction it is assumed that a nitric oxide molecular ion in its ground state captures a free electron of low energy and splits up into two neutral atoms in the state $N(^2D) + O(^3P)$. The calculation of such cross sections is of particular interest in considerations involving the D-region of the ionosphere. The reaction is broken up by assuming the existence of an intermediate state NO* which invariably decays into N and O. Time-dependent first order perturbation theory is then used to calculate the cross section for the reaction NO pos. + e neg yields NO*. The method follows to a large extent that outlined by Bauer and Wu (Canadian J. Phys. 34, 1436, 1956), but differs from this work in several important particulars. The previous work is discussed and criticized. Using quite rough approximations at the end of the calculation it was found that the cross section for 1 ev. electrons is of the order of 12 x 10 to the -16 sq. cm. (Author)

Astrophysics

PB 154 923 $3.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AN INVESTIGATION OF LUNAR AND AURORAL RADIO ECHOES, by H. A. von Biel. Summary scientific rept. for 15 Oct 60 on Contract AF 19(604)6116. [1960] 33p. 8 refs. Rept. no. CM-1393-P-4; AFCRL-TN-60-1183; AD-231 632.

DESCRIPTORS: *Moon, *Radio astronomy, *Aurorae, *Echo ranging, Radio signals, Ultra high frequency, Reflection, Ionosphere, Parabolic antennas, Polarization.

An experimental investigation of lunar and auroral echoes at 915 mc is summarized. Preliminary results indicate that about 90% of the total power contained in lunar echoes is reflected from an area on the moon not larger than 3% of the visible lunar surface The echo exhibits Rayleigh-like fading when averaged over a one minute time interval. There is evidence that the entire visible lunar surface contributes toward the total echo power. No auroral echo data were collected. (Author)

PB 155 489 $2.60

Georgetown Coll. Observatory, Washington, D. C.
RECENT STUDIES OF THE KNOWN PHYSICAL CHARACTERISTICS OF THE MOON AND THE PLANETS, by Carl C. Kiess and Dion Scott Birney. Rept. on Contract AF 19(604)7203. Dec 60, 21p. 119 refs. GCO monograph no. 15; AFCRL-TN-60-666; AD-253 575.

DESCRIPTORS: *Moon, Extraterrestrial geography, *Planets, Surface properties, Surface area, Physical properties, Exploration.

Contents:
Moon: Surface features of the moon; The moon's atmosphere; Temperature conditions on the moon; Mechanics of the moon. Venus: Surface features; The atmosphere of Venus; Rotation period; Radio-wave and radar observations of Venus; Temperature and mechanical properties of Venus. Mars: Surface features; Atmosphere; Mechanics; Habitability. Jupiter: Surface features; The spectrum and atmosphere; Radio-wave emission

PB 155 660 $4.60

Harvard Coll. Observatory, Cambridge, Mass.
CLASSIFICATION OF SOLAR PROMINENCES. XI. 1944, by Donald H. Menzel and F. Shirley Jones. Scientific rept. no. 9 on Contract AF 19(604)4962. Apr 61, 43p. AFCRL-262; AD-254 025.

DESCRIPTORS: *Solar flares, Classification.

The observations used in this research consist of the complete set of prominence surveys made at the High Altitude Observatory at Climax, Colorado, during 1944, and motion picture films of prominences made on 46 days during the same year at the same observatory. Table I contains the measures of position and area, the intensity estimates, and the classification according to the Menzel and Evans scheme (1953), of all the prominences in the surveys. The classifications for the prominences in the motion picture studies are presented in Table II. (See also PB 154 585)

PB 154 989 $11.00

Harvard Coll. Observatory, Cambridge, Mass.
THE OCCULTATION OF REGULUS BY VENUS, JULY 7, 1959, by Donald H. Menzel and Gerard de Vaucouleurs. Scientific rept. no. 1 (Final) on Contract AF 19(604)7461. 10 Jan 61, 147p. 19 refs. AFCRL-227; AD-251 664.

DESCRIPTORS: Stars, *Stellar eclipses, *Venus, Photographic analysis, *Planetary atmospheres, Photometers, Height finding, Tables.

The occultation of the first-magnitude star Regulus (Alpha Leonis) by the planet Venus on July 7, 1959, was observed photographically, photoelectrically, and visually by seven groups. The observations are reported in detail. Corrections to the ephemeris coordinates differences between the planet and the star, and a determination of the height, h = 70 km, of the occulting layer above the cloud layer are given. The photometric observations are used to derive the scale height, H = 6.8 km, and its first derivative = 0.01 H and the total pressure p = 2.6 dynes/sq cm at the occulting layer. (Author)

BEHAVIORAL SCIENCES

PB 156 117 $5.60

Richardson, Bellows, Henry and Co., Inc., New York.
CONSTRUCTION OF THREE MEASURES FOR INSTRUCTOR EVALUATION, by L. C. Seeley. Interim rept. on Educational Research Project, Contract N7onr-383. 20 July 48, 52p. 6 refs. Rept. 383-1-5; ATI-1418.

This report released for sale to the public 8 June 61.

DESCRIPTORS: Naval personnel, Aviation personnel, *Training, *Instructors, Effectiveness, Education. *Military training

The steps taken in the development of instruments for appraising the effectiveness of ground school instructors in the Naval Air Training Command are summarized. The problems which prompted the undertaking of the project and benefits accrued are pointed out along with the need for further steps in the validation and refinement of the measures produced.

Human Engineering

PB 156 152 $4.60

Air Force Command and Control Development Div., Bedford, Mass.
BIBLIOGRAPHY OF TECHNICAL PUBLICATIONS, SEPTEMBER 1960, AND SUPPLEMENT NO 1. Rept. for Nov 59-31 Aug 60. 3 Jan 61, 49p. 437 refs.

This report released for sale to the public 13 June 61.

DESCRIPTORS: Air force research, Scientific reports, *Human engineering, Bibliography.

PB 156 281 $2.60

Douglas Aircraft Co., Inc., El Segundo, Calif.
TRENDS IN APPLIED BIO-ELECTRONICS. CURRENT NEEDS AND TRENDS IN THE DEVELOPMENT OF BIO-ELECTRONIC EQUIPMENT SYSTEMS FOR THE MONITORING AND ANALYSIS OF HUMAN PHYSIOLOGICAL RESPONSES, by George A. Peters and Harvey F. Glassner. Rept. on Contract Nonr-1076(00). Feb 60, 28p. 11 refs. Engineering paper no. 972; AD-234 038.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Bioelectronics, *Electronic equipment, Physiology, Human engineering, Instrumentation, Biophysics, *Medical equipment, *Miniature electronic equipment, *Subminiature electronic equipment, Monitors.

Contents:
Miniaturization
- Conventional apparatus
- Transistorized instrumentation
- Sensor-amplifier module
- Sensor-amplifier transmitter
- Mini-sensor

Data processing
- Direct writeout
- Computed writeout
- Digital readout
- Functional readout
- Integrated display

Costs
- Reliability
- Fidelity
- Meaningfulness

PB 149 901 $8.10

Engineering Psychology Lab., U. of Pittsburgh, Pa.
INVESTIGATION OF MACHINE-ASSISTS TO OPERATOR PERFORMANCE: I. LITERATURE ANALYSIS AND EXPERIMENTAL DETAILS, by Harold C. Strasel Richard A. Regan, and Robert Glaser. Technical rept. no. 1 on Contract Nonr-624(11). June 60, 83p. 69 refs.

DESCRIPTORS: *Human engineering, Monitors, Tracking, Coding, Conditioned reflex, Signals, Detection, Behavior, Machines.

This report presents the first in a series of studies directed at the investigation of possibilities for the incorporation of behavioral principles into man-machine system design to facilitate operator performance of perceptual-motor type tasks. The basic aim of this project is to define and investigate certain behavioral principles which, when built into the machine component of a given system, will serve to facilitate performance of the human task in the system. Such principles are "machine-assists". Tasks are formulated and individually, but successively, developed. These are: to conduct a review and analysis of the basic human engineering literature pertinent to skilled operator perceptual-motor performance to determine operator tasks and task-variables holding promise for further study under the machine-assist concept; and to determine from the data collected what general principles can be isolated which lead to direct applications for the machine aiding of human performance. (Author)

Psychology

PB 171 829 $1.00

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
BIBLIOGRAPHY OF RESEARCH REPORTS AND PUBLICATIONS ISSUED BY THE BIO-ACOUSTICS BRANCH. Dec 60, 33p. 288 refs. AD-252 734.

DESCRIPTORS: *Bibliography, Space medicine, Scientific reports, *Acoustics, *Noise, Sound, *Vibration, Ear, Physiology, Indexes, Psychology, Psychoacoustics, *Biophysics.

Contents:
Sound sources and noise fields
Sound propagation
Acoustic instrumentation
Noise control--general
Noise control structures
Hearing and physiology of the ear
Speech
Biological and psychological effects of noise
Ear protection
Mechanical characteristics of the human body: Effects of vibrations and shocks
General noise guides and criteria
Bionics
(See also PB 143 944)

PB 155 104 $3.60

California U., Santa Barbara.
THE EFFECTS OF GROUP MEMBERSHIP UPON RISK TAKING, by Brendan Lonergan. Technical note no. 1 on Contract AF 49(638)794. Dec 60, 35p. 31 refs. AFOSR-94; AD-252 295.

DESCRIPTORS: *Group dynamics, Probability, Theory, *Behavior, Reasoning, *Games theory, Mathematical prediction, Sociometrics.

The social influence of a group on individual risk-taking was studied. The theoretical and empirical framework for this study is discussed under the separate headings of Normative Behavior, Risk-Taking Behavior, and Defining Group. The assumptions and measurement procedures employed are discussed in a subsequent section. (Author)

PB 155 530 $1.10

Cambridge U. (Gt. Brit.)
THE EFFECTS OF FRONTAL LESIONS AND NITROUS OXIDE ON THE TIMING BEHAVIOUR OF MONKEYS AND EFFECTS OF LIMITED LESIONS OF THE STRIATE CORTEX ON THE VISUAL BEHAVIOUR OF MONKEYS, by Lawrence Weiskrantz. Annual summary rept. no. 2 on Contract AF 61(052)185. 31 Dec 60, 5p. AFOSR-TN-60-712; AD-253 777.

DESCRIPTORS: *Cerebral cortex, *Visual acuity, Measurement, Stimulation, *Primates, Nitrogen compounds, Oxides, Behavior, *Reaction time, Wounds.

PB 154 151 $28.50

Human Sciences Research, Inc., Arlington, Va.
ANNOTATIONS OF SMALL GROUP RESEARCH STUDIES, by Irwin Altman, Catherine Pendleton, and Anita Terauds. Rept. on Contract AF 49(638)256. Oct 60, 681p. 7 refs. HSR-RR-60/5-GN: AFOSR TN-60-1208; AD-248 440.

DESCRIPTORS: *Group dynamics, *Bibliography, Acceptability, Attitudes, Behavior, Coding, Effectiveness, Leadership, Psychometrics, Production, Personality, Perception, Reasoning, Sampling, Social communication, Sociometrics.

This report of study annotations is divided into three major sections. The first describes sampling procedures and general actuarial characteristics of the review studies. The next section presents the annotation procedures and discusses how to make use of the annotations. The third and major section of the report contains the individual study annotations, each of which specifies study purpose, study procedure, research results, and variables. This section also contains a special review of 50 studies having relationships which are concerned with individual and group effectiveness. Finally, a last section is a list of existing and soon forthcoming reports of the research program. (Author)

PB 156 122 $1.60

Iowa State U., Iowa City.
POSITIONING REACTIONS OF UNIFORM LENGTH EXECUTED AT VARIOUS DISTANCES FROM THE BODY, by Judson S. Brown and E. B. Knauft. Rept. no. 4 on Contract N50ri-57, Proj. 2. July 48, 17p. 1 ref. ATI-37 575.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Body, Motion, *Feet, *Hands, *Eye, Physiology, Tests, Determination, *Reaction (Psychology), Human engineering, *Psychomotor tests, Statistical analysis, Instrument dials, Instrument panels.

An investigation was made of the ability of subjects to perform positioning reactions involving movements of a constant length but executed at various distances from the front of the body. All movements were 10 cm. in length and were confined to a line lying in the horizontal plane and perpendicular to the frontal plane of the body. The subjects were required to perform outward and inward movements at various distances from the body. In general, the results indicate that the accuracy which a movement can be determined at a desired position is not significantly affected by the distance from the body at which it is executed when the length of the movement remains constant. This is apparently the case for both inward and outward movements. (Author)

PB 156 294 $5.60

[Personnel Research Board] Ohio State U., Columbus.
CREW MEMBER AGREEMENT ON RB-47 CREW OPERATING PROCEDURE, by Paul D. Hood, Andrew W. Halpin and others. Rept. on Contract AF 18(600)1051. May 57, 52p. 10 refs. Research rept. AFPTRC-TN-57-64; AD-126 395.

This report released for sale to the public 6 June 61.

DESCRIPTORS: *Aviation personnel, Test methods, *Group dynamics, *Aerial reconnaissance, *Job analysis, *Attitudes.

A report is given of the search for a technique with which to identify and evaluate the crew operating procedures (COP) developed by different crews. Particular

attention was directed to the relationship between crew agreement on COP's and superiors' ratings of crew proficiency. Mission planning, high-altitude photo run, RBS simulated photoflash bomb run, and night celestial navigation constituted the tasks represented on a 358-item questionnaire which was developed and independently administered to members of RB-47 photo-reconnaissance crews. The responses indicated who did what and when. Indexes of agreement among crew members with respect to the performance of crew duties were computed from the responses in each task area. The following conclusions were drawn: (1) the most convenient, single index provided by the COP test is a total of the number of test items on which the responses of all 3 crew members agree, (2) the more experience members have in flying together, the higher the COP total agreement score, (3) chance relationships obtain between the COP total agreement score and the objective criteria, (4) crews who are rated high on crew proficiency make smaller error scores on the objective criteria, (5) the estimated correlation between an empirically determined COP agreement score and the superiors' ratings of crew proficiency is 0.50, and (6) the COP agreement scores possess unique, practical advantages, and with RB-47 crews the score from the 75-item key will serve as an additional objective criterion of crew effectiveness.

BIOLOGICAL SCIENCES

PB 155 680 $1.10

School of Aviation Medicine, Brooks AFB, Tex. AEROBACTER-SHIGELLA ANTAGONISM: A SURVEY OF 264 MACACA MULATTA AND IN VITRO STUDIES OF ISOLATES, by Anna C. Garner and E. Staten Wynne. Dec 60, 6p. 12 refs. Rept. 61-24; AD-254 371.

DESCRIPTORS: Primates, *Intestinal bacteria, *Shigella, Physiology, Bacteria.

There are several reports in the literature of antagonism of Aerobacter toward Shigella. Since shigellosis is an important disease in Macaca mulatta, investigations were conducted with this primate on the possibility of in vivo antagonism between the two genera. Examination of fecal specimens of 264 monkeys revealed Shigella but not Aerobacter in 4, Aerobacter but not Shigella in 16, and both genera in 1. In the animal with both organisms, however, the ratio of Shigella to Aero bacter was considered so high (150:1) as to preclude effective antagonism. As a result of the low incidence of both genera, the lack of coexistence did not reach statistical significance. Occurrence of in vivo antagonism, however, was rendered plausible by strong in vitro antagonism in liquid cultures between all 17 Aerobacter isolates and all 5 Shigella isolates. (Author)

PB 155 673 $1.60

School of Aviation Medicine, Brooks AFB, Tex. PROGRESS IN STAPES MOBILIZATION SURGERY. AVIATION MEDICINE IMPLICATIONS, by Ralph N. Kraus. Sep 60, 14p. 27 refs. Aeromedical Reviews 4-60.

DESCRIPTORS: *Ear, *Surgery, Aviation personnel, *Aviation medicine.

Otosclerosis is the most common cause of progressive hearing loss of a conductive type in adults. Stapes mobilization effected by the direct method was revived in 1953. Recent procedures involve fenestration of the footplate, the use of a vein graft, and reconstruction of the stapes with tantalum or stainless steel wire or a polyethylene prosthesis. Fenestration of the horizontal semicircular canal is ordinarily considered permanently disqualifying for flying duties and a waiver can be granted only by the Surgeon General, U.S. Air Force. An Air Force policy has not been formulated with regard to fenestration of the footplate of the stapes. Aviation medicine principles should be considered in the choice of a surgical procedure for otosclerosis performed on an aircrew member. Mobilization of the stapes achieved conservatively by manipulation of the head of the stapes or occasionally by chisels is recommended and has been demonstrated not to have adversely affected the performance of flying duties by aircrewmen. Until it has been definitely determined that the middle ear can tolerate fenestration or removal of the footplate, addition of grafts and prostheses, without compromising the integrity of the inner ear while being subjected to the inevitable, repeated bouts of severe atmospheric pressure changes encountered in military aircraft, it would seem wise to refrain from using these procedures on flying personnel. (Author)

PB 155 679 $1.10

School of Aviation Medicine, Brooks AFB, Tex. STRESS PATTERNS IN DENTAL PATIENTS. LOCAL ANESTHESIA AND SIMPLE EXODONTIA, by Ira L. Shannon, John R. Prigmore and others. Dec 60, 7p. 32 refs. Rept. 61-23; AD-254 064.

DESCRIPTORS: *Stress (Physiology), Serum, *Dentistry, *Dental surgery, Measurement, *Dental anesthesia, Corticosteroids, Sodium, Dental research, Surgical trauma, Potassium, Stress (Psychology).

Serum free 17-hydroxycorticosteroids, sodium, and potassium were measured in 114 healthy young adult males undergoing various types of dental operations. Lower molar extractions were carried out in 53 subjects; the remaining participants received local anesthetic agents of different types in varying oral locations. The following conclusions were drawn: The administration of local anesthetic agents did not produce significant cortical response. The psychic trauma of anticipating oral surgery appeared to be a significant stimulus to the cortex. A direct effect attributable to tooth removal, per se, was not seen. It is possible that sampling time could have been such as to miss a slight fleeting stimulus, but it seems more likely that the high preoperative steroid levels masked the response. There were no significant differences in serum sodium or potassium under any of the imposed experimental conditions. (Author)

PB 149 005 $1.10

University of Southern California, Los Angeles. SULFUR INCORPORATION INTO THE GALACTAN SULFATE OF PORPHYRIDIUM CRUENTUM, by R. F. Jones. Final rept. June 59-June 60, on Contract Nonr-228(18). 1 July 60, 7p. 11 refs. AD-240 124.

DESCRIPTORS: *Algae, *Sulfur, Culture media, *Sulfates, Saccharides, *Metabolic products, Chemical analysis.

Methods have been developed for the growth of Porphyridium cruentum in a complete artificial growth medium suitable for small and large scale culture. The extra-cellular material produced by the alga has been found not to be a simple galactan sulfate as originally anticipated but a complex sulfated polymer of galactose, glucose and xylose, similar to the cell wall material of the organism. Examination of purified preparations of this material by chromatography, ultracentrifugation and electrophoresis, together with a study of its production with variation of certain of the constituents of the growth medium are described. The utilization of various sources of sulfur by the alga is also described. (Author)

Anatomy and Physiology

PB 155 685 $1.60

Albany Medical Coll., N. Y.
THE EFFECT OF HYPERVENTILATION ON GLOMERULAR FILTRATION AND RENAL PLASMA FLOW, by G. S. Kanter. Mar 61, 5p. 19 refs. AFSAM rept. 61-48; AD-254 375.

DESCRIPTORS: *Oxygen poisoning, *Physiology, Dogs, *Kidneys, Blood plasma, Poisoning.

Seven dogs were anesthetized with 30 mg./kg. of sodium pentobarbital. Creatinine clearance was used as a measure of glomerular filtration rate and clearance of paraaminohippuric acid at low plasma concentration was used as a measure of renal plasma flow. After two control periods, the dogs were progressively hyperventilated. The respiratory minute volume was increased from about 4 liters/min. at the start of the hyperventilation to about 8 liters/min. at the end of 3 hours of overventilation. The anaerobically measured arterial pH rose from a control value of 7.33 to 7.63 at the conclusion of the experiment. No change occurred in the glomerular filtration rate, renal plasma flow, filtration fraction, hematocrit, rectal temperature, heart rate, or total solids in the plasma. Passive hyperventilation, leading to pronounced alkalosis of short duration, does not appear to alter renal hemodynamics sufficiently to cause any change in the filtration rate or the effective renal plasma flow. (Author)

PB 155 544 $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
CARDIOVASCULAR EFFECTS OF REFEEDING STRESS FOLLOWING STARVATION X. AD LIBITUM REFEEDING OF GLUCOSE OR STARCH, by G. S. Smith and B. Connor Johnson. Feb 61, 15p. 4 refs. Technical note AAL-TN-60-29; AD-253 715.

DESCRIPTORS: Electrocardiography, Starches, *Stress (Physiology), *Starvation, Heart, Animals, *Diet, *Feeding, *Food, Glucose.

This report is concerned with the responses of young swine to an initial, acute starvation-refeeding episode in which the effects of refeeding diets high in content of either glucose or starch were compared. (Author) (See also PB 154 168)

PB 155 540 $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE MERCURY GAUGE METHOD OF DIGITAL PLETHYSMOGRAPHY, by C. J. Eagan. Feb 61, 17p. 9 refs. Technical note AAL-TN-60-15; AD-253 711.

DESCRIPTORS: *Strain gages, Blood volume, *Blood circulation, Instruction manuals, Man, Mercury, Physiology, Calibration, Test methods, Measurement Hands, *Fingers, Medical equipment.

The connecting circuit, techniques of calibration, and method of attachment to the finger, have been described for a small mercury strain gauge for use in digital plethysmography. Special capabilities for the mercury gauge method have been demonstrated by examples of the types of volume change which can be measured in the finger tip. Typical values have been given for each example. For some of these measurements, there is no mention in the literature on plethysmography to indicate that they have ever been made previously. (Author)

PB 155 620 $1.10

Bryn Mawr Coll., Pa.
TISSUE CITRIC ACID AND SUSCEPTIBILITY TO INFECTION IN MICE DURING CHRONIC HYPOXIA AND FLUOROACETATE POISONING, by Anne E. Hudock and L. Joe Berry. Dec 60, 9p. 11 refs. AFSAM rept. 60-92; AD-254 368.

DESCRIPTORS: Acceleration, Physiology, *Tissues (Biology), Mice, *Citric acids, *Anoxia, *Acetates, *Fluorides, *Poisoning, *Salmonella infections, Infections.

A comparison is made in tissue citrate of male and female mice under control conditions, following 3 to 6 weeks' continuous exposure to a simulated altitude of 20,000 feet, and 1 hour after an intraperitoneal injection of fluoroacetate. Males have uniformly less tissue citrate than females, but it decreases in both sexes by the same percentage following chronic hypoxia and increases proportionately in both after fluoroacetate inhibition. Citrate in tissues of all females is decreased 2 weeks after adrenalectomy, but in males under similar conditions the changes are erratic. The two sexes are equally susceptible to infection with Salmonella typhimurium and to fluoroacetate poisoning; yet strain differences emerge. No correlation is possible between either type of susceptibility and level of tissue citrate. (Author)

PB 155 677 $1.60

Chicago U., Ill.
THE CALORIC TEST IN THE CAT, by Nils G. Henriksson, Cesar Fernandez, and Robert I. Kohut. Nov 60, 15p. 9 refs. AFSAM rept. 61-13; AD-254 369.

DESCRIPTORS: Cats, Physiology, *Eye, *Motion, Ear, Heat.

A simple device for fixing both head and body of the cat was designed so that the nystagmic reaction to caloric stimulation could be investigated. Nystagmographic tracings, relatively free of artifacts induced by movements, were obtained of both ordinary and derived nystagmus. In order to produce a caloric reaction in the cat, it was necessary to set the temperature of the irrigating water to, at least, 10° C. either below or above the rectal temperature (38° C.). Repetitive caloric stimulation with both cold and hot water was conducted under various conditions and the results were described for each. The data suggested the most appropriate way for obtaining reliable results with the caloric test in the cat. (Author)

PB 155 532 $1.10

Marseille U. (France).
NEUROPHYSIOLOGICAL MECHANISMS OF SKILLED MOVEMENTS, by Jacques Paillard. Annual summary rept. for 1 May 59-30 Apr 60 on Contract AF 61(052)95. 31 May 60, 7p. AFOSR TN-60-1490; AD-253 849.

DESCRIPTORS: Neurology, *Neuromuscular transmission, Test methods, *Muscles, *Nerves, Motor reactions, Physiology, Inhibition, Stimulation, Electrical properties.

Technics of investigation of the monosynaptic test in man are now correct. The problems of the restraining table, percussion apparatus, electronic stimulator have been satisfactorily solved. Using the Hoffmann's reflex as a test an attempt was made to analyse the nature of the generalized spread of activity which accompanies the performance of a voluntary act depending on the speed, intensity and duration of it. Even with very simple movement, whatever the muscle group involved, one is able to detect a brief facilitation of motoneurones of the triceps surae (with no overt muscle response) at the start of the movement and a long lasting inhibition at the end. A systematic comparison between the reflex responses to electrical stimulation and the responses obtained by mechanical percussion of the tendon demonstrates identical electromyograms (both as regards form and duration of the muscular action potential).

PB 155 682 $4.60

Radiobiological Lab., U. of Texas, Austin.
STUDIES OF ESCAPE FROM BALLISTIC SPACE VEHICLES. I. BIOMEDICAL EVALUATION. II. INSTRUMENTATION, by Cloid D. Green (School of Aviation Medicine) W. Lynn Brown and others. Apr 61, 43p. 16 refs. AFSAM rept. 61-29; AD-254 065.

DESCRIPTORS: *Space medicine, Space flight, Space capsules, Primates, Acceleration, *Survival, Physiology, *Stress (Physiology), Instrumentation, Motor reactions.

Biomedical information on primates successfully flown through programed escape profiles was obtained in conjunction with the NASA project "Little Joe." Animal response during acceleration, deceleration, re-entry, and water impace demonstrated survivability. Also recorded and evaluated were: (a) environmental data (i.e., relative humidity, total gas pressure, O_2 partial pressure, and gas temperature); (b) physiologic data (i.e., respiratory rate, pulse rate, and cardiac rhythm from ECG tracings); (c) psychomotor performance data; and (d) oculomotor movement. These experiments substantiate, under actual flight conditions, physical and biologic design criteria for biopacks, physiologic sensor response, and performance criteria during all phases of the ballistic trajectory and recovery operations from an impact area. (Author)

PB 155 683 $1.60

School of Aviation Medicine, Brooks AFB, Tex.
INFLUENCE OF INTERMITTENT EXPOSURE TO SIMULATED ALTITUDE ON PLASMA AND TISSUE ELECTROLYTES IN RATS, by Johnie L. Reeves. Feb 61, 20p. 36 refs. Rept. 61-37; AD-254 373.

DESCRIPTORS: *High altitude, *Physiology, Rats, *Blood plasma, Tissues (Biology), *Electrolytes (Physiology).

Young adult rats exposed four hours each day to 380 mm. Hg barometric pressure in an altitude chamber for twenty-six to twenty-eight weeks exhibited changes in body weight, organ weight, hemoglobin, and hematocrit of the same order of magnitude as rats continuously exposed to the same conditions. Plasma cation concentration was not affected, but a substantial shift occurred in the relative concentrations of anions. With the exception of the ventricular myocardium, the electrolyte composition of soft tissues did not materially change. The femoral shaft, the most severely affected of the tissues, exhibited depletion of calcium, phosphorus, and sodium and, at the same time, an accumulation of potassium. The decrease of bone electrolytes was in a ratio which indicated complete solution of the apatite crystal rather than anionic or cationic exchange reactions. Should these observations on bone dissolution and myocardial electrolyte shift be confirmed in rats and other species, the safety of altitude acclimatization by the means used in the study would be questioned. (Author)

PB 155 678 $1.10

School of Aviation Medicine, Brooks AFB, Tex.
SURVIVAL OF THE ISOLATED EMBRYONIC HEART WHEN EXPOSED TO HIGH RELATIVE CENTRIFUGAL FORCES, by Allan A. Katzberg and George T. Daye. Dec 60, 10p. 7 refs. Rept. 61-19; AD-254 370.

DESCRIPTORS: Chicken, Embryos, *Heart, *Survival, *Acceleration tolerance.

The effects of increased gravitation on the isolated embryonic chick heart were studied. Chick embryos that had incubated from 4 to 18 days were used as sources of the hearts. It was found that the younger hearts were more resistant to trauma induced by gravitational stresses. Many of the young specimens withstood the effects of 98,500 x gravity, while most of the older group entered total cardiac arrest at levels less than the equivalent of 15,000 x gravity. Tracings made with an electrocardiograph substantiated these findings. (Author)

PB 155 106 $1.60

Stanford U., Calif.
NEURAMINIC ACID AND CENTRAL NERVOUS SYSTEM FUNCTION, by Windsor Cutting, Noreen Eldredge, and George Read. Rept. on Contract AF 49(638)714. [1960] 19p. 26 refs. AFOSR TN-60-1430; AD-252 438.

DESCRIPTORS: *Neuraminic acids, *Brain, *Spinal cord, Physiology, Metabolism.

Neuraminic acid is present in the central nervous system combined with lipids and proteins. Its function is unknown. It may participate in a blood-brain barrier antibody system which maintains the special internal environment of the brain. Disfunction of the brain might result from failure of this system under stress, as in anoxia. This study was initiated to evaluate neuraminic acid for physiological activity. The project was two-fold: (1) The isolation of gram quantities of N-acetyl neuraminic acid (NANA), free and bound; and (2) Testing for the effects of these compounds on a cat, rats, mice and goldfish. The variables tested were random motion, blood pressure, pulse pressure, heart rate, respiratory rate, respiratory amplitude, electroencephalogram, and skin resistance. There was no altered physiological activity when NANA (free and bound) was injected alone or in conjunction with delta-aminobutyric acid. NANA with lysergic acid diethylamide (LSD) showed no different effects than LSD alone. Results suggest that NANA should be depleted or inactivated in order to show NANA's role in brain metabolism. This is the approach we intend to pursue in future studies. (Author)

PB 155 681 $1.60

Texas U. Medical Branch, Galveston.
THE BIOCHEMISTRY AND PHYSIOLOGY OF UROKINASE, by D. R. Celander and M. M. Guest. Nov 60, 15p. 33 refs. AFSAM rept. 61-25; AD-254 372.

DESCRIPTORS: Urine, Fibrinolysin, Biochemistry, Physiology, *Urokinase, Enzymes.

The development of methods for isolating, purifying, and assaying urokinase, the urinary enzyme activator of plasma profibrinolysin, is described. Properties of the enzyme are given and the unit of activity is defined and related to units of other workers. Studies of urokinase excretion are reported and note made of limitations which must be imposed upon interpretation of variations in amount of enzyme excreted. Of particular importance is the possible existence of more than one molecular species of urokinase. Plasma profibrinolysin preparations obtained from representatives of species ranging from man through lower mammals to fish can be activated by human urokinase. Profibrinolysin preparations from pig plasma are susceptible to urokinase activation only after the removal of inhibitors. Human urokinase has been used as a major tool in the detection of profibrinolysin in a variety of plasma protein preparations and in the development of procedures designed to remove profibrinolysin from such preparations as fibrinogen and thrombin. Human urokinase injected into heterologous species has been shown to be an antigen. This property has been utilized to demonstrate that parenterally administered human urokinase is excreted in the urine of injected rabbits with no apparent alteration in either enzymatic or immunologic characteristics. (Author)

PB 156 321 $4.60

Washington U., Seattle.
ACCLIMATIZATION TO COLD ENVIRONMENT. PHYSIOLOGIC MECHANISMS, by L. D. Carlson, A. C. Young and others. Rept. for 1949-1950 on Contract AF 33(038)422. Mar 51, 46p. 28 refs. AF Technical rept. no. 6247; ATI-110 684.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Body temperature, *Blood circulation, Hands, *Exposure, Food, Metabolism, Diet, *Heat production (Biology).

The physiologic factors involved in acclimatization to cold environments are discussed. The mechanisms of acclimatization appear to involve an increased caloric intake balancing the increased heat output. From the data presented, it seems that due to readjustments which provide for an increased shell and reduced core temperature, acclimatized individuals should require less caloric input than non-acclimatized on intermittent exposure. This change is accompanied by a relatively increased circulation to the hands which should increase efficiency. The various gaps in data and the practical implications are briefly discussed. (Author)

PB 155 684 $1.60

Washington U., Seattle. School of Medicine.
HUMAN PERFORMANCE UNDER DIFFERENT THERMAL LOADS, by Loren D. Carlson. Mar 61, 14p. 12 refs. AFSAM rept. 61-43; ad-254 374.

DESCRIPTORS: *Heat tolerance, Stress (Physiology), *Physiology, Conditioned reflex.

This report outlines a hypothesis concerned with the interaction of physiologic inputs from environmental temperature and low oxygen tension, and psychologic inputs from a vigilance test. Blood flow, pulse rate, rectal temperature, GSR, and vigilance were measured in a normal and in a hot environment. There were marked individual differences in response, some of which appear to be related to physical fitness. Vigilance was impaired in the hot environment at higher levels of input. (Author)

Biochemistry

PB 153 411 $3.60

Biophysics Lab., Stanford U., Calif.
ELECTRON PARAMAGNETIC RESONANCE STUDIES OF BIOLOGICAL AND BIOCHEMICAL SYSTEMS, by M. S. Blois. Final rept. 1 July 55-31 Aug 60, on Contract AF 18(600)1511. Oct 60, 32p. 25 refs. B. L. rept. no. 12; AFOSR-TR-60-147; AD-247 438.

DESCRIPTORS: *Paramagnetic resonance, Electrons, *Biochemistry, *Free radicals, Melanin, Quinones, Measurement, Oxidation, Reduction, *Biophysics, Alcohols, Synthesis, Enzymes.

Contents:
Semiquinone free radicals
The synthesis of melanin
Free radical g-values
"The precise measurement of free radical g-values and their dependence upon structure."

PB 155 531 $1.60

Edinburgh U. (Gt. Brit.).
THE ACTION OF DRUGS ON THE NORADRENALINE CONTENT OF BRAIN AND SYMPATHETIC GANGLIA, by S. Sanan and M. Vogt. Technical rept. on Effect of Drugs on the Catecholamine Content of Nervous Tissue, Contract AF 61(052)277. 15 Aug 60, 15p. 8 refs. AFOSR TN-60-1286; AD-246 171.

DESCRIPTORS: *Epinephrine, *Drugs, *Brain, *Nerves, Amines, Oxidases, Inhibition, Behavior, Tissues (Biology), Hypotension, Dosage, Ataxia, Chemical reactions, Biochemistry, Motor reactions.

Dimethylphenylpiperazinium iodide, given at frequent intervals intravenously to rabbits (total dose during 4 hr. period 3.5-11.1 mg/kg), often, but not invariably, lowered the concentration of noradrenaline in the superior cervical ganglia. 10-Methoxydeserpidine and guanethidine depleted peripheral sympathetic ganglia of their noradrenaline in cats and rabbits; hypothalamic noradrenaline remained unchanged in the rabbit but fell in the cat. Repeated doses of the amine oxidase inhibitors amphetamine hydrazine and phenylhydrazinobutane increased the noradrenaline content of the brain but behavioural effects were small and not related to the level of noradrenaline produced by the drug. (Author)

PB 156 105 $1.60

Ohio State U. Research Foundation, Columbus.
MECHANISM OF ACTION OF DEOXYRIBONUCLEASE, by Walter J. Frajola. Final rept. on Contract AF 18(603)125. 10 Nov 59, 18p. Rept. 706; AFOSR-TR-59-188; AD-231 402.

DESCRIPTORS: *Nucleic acids, *Ribonuclease, Nucleotides, *Enzymes, Electron microscopy, Nucleoproteins, Biochemistry, Chemical reactions, *Enzymolysis.

Procedures are described for the examination of DNA in the electron microscope before and after treatment of the DNA with the enzyme, DNase. These procedures include a technique involving spraying the DNA solution upon freshly-cleaved mica and a technique involving the withdrawal of a monomolecular film of DNA upon a freshly-cleaved surface of mica. Either technique may be utilized for the production of long thin strands of DNA molecules. The enzymatic digestion of the DNA appears to occur in a random fashion without the production of smaller particles of uniform size or shape observable by the present techniques of electron microscopy. (Author)

Radiobiology

ANL-6297 $2.50

Argonne National Lab., Ill.
RADIOLOGICAL PHYSICS DIVISION. Semiannual rept. July-Dec 60, on Contract W-31-109-eng-38. Feb 61, 134p.

PB 152 706 $2.60

Duke U., Durham, N. C.
ELECTRON SPIN RESONANCE OF AN IRRADIATED SINGLE CRYSTAL OF N-ACETYLGLYCINE, by Ichiro Miyagawa, Yukio Kurita, and Walter Gordy. Rept. on Contract [AF 18(600)497]. [1960] 23p. 9 refs. AFOSR TN-60-1251; AD-247 412.

DESCRIPTORS: *Acetyl radicals, *Glycines, Single crystals, Radioactivity, Gamma rays, *Free radicals, Electrons, Spin, Resonance absorption, *Molecular structure, *Proteins, *Radiation damage.

Electron spin resonance absorption of an irradiated single crystal of N-acetylglycine was observed at room temperature at 9 kMc/sec and 23 kMc/sec. From the analysis of the anisotropy in the spectroscopic splitting factor and in the nuclear hyperfine interaction constant, a chemical structure is deduced for the free radical. The C-H bond is in the NCC plane and approximately along the bisector of the NCC angle. The unpaired electron spin density is essentially in a π-orbital, about 72 percent of which is the p orbital of the CH carbon directed perpendicular to the NCC plane. (Author)

PB 152 704 $3.60

Duke U., Durham, N. C.
STRUCTURE AND ORIENTATION OF FREE RADICALS FORMED BY IONIZING RADIATIONS IN CERTAIN NATIVE PROTEINS, by Walter Gordy and Howard Shields. Rept. on Contract [AF 18(600)497]. [1960] 38p. 18 refs. AFOSR TN-60-1249; AD-247 412.

DESCRIPTORS: *Free radicals, *Molecular structure, Proteins, *Radiation damage, Electron transitions, *Radioactivity, Ionization, Spin, Electrons, Gamma rays, Resonance absorption.

PB 152 705 $2.60

Duke U., Durham, N. C.
TEMPERATURE EFFECTS OF FREE RADICAL FORMATION AND ELECTRON MIGRATION IN IRRADIATED PROTEINS, by Frank Patten and Walter Gordy. Rept. on Contract [AF 18(600)497]. [1960] 24p. 7 refs. AFOSR TN-60-1250; AD-247 412.

DESCRIPTORS: *Free radicals, Temperature, *Molecular structure, Proteins, *Radiation damage, Electron transitions, *Radioactivity, Ionization, Spin, Electrons, Gamma rays, Resonance absorption.

UCRL-9592 $2.50

Lawrence Radiation Lab., U. of California, Berkeley.
THE LIPID SYNDROME IN MAMMALIAN RADIOBIOLOGY WITH EMPHASIS ON POSTIRRADIATION PROTECTION OF ANIMALS WITH LIPIDS, by J. K. Ashikawa. Rept. on Contract W-7405-eng-48. 1 Mar 61, 128p.

ORNL-3094 $1.00

Oak Ridge National Lab., Tenn.
INSECT SPECIES ON VEGETATION OF THE WHITE OAK LAKE BED, OAK RIDGE, TENNESSEE, by H. F. Howden and D. A. Crossley, Jr. Rept. on Contract W-7405-eng-26. 37p.

ORNL-2748 Part B $2.75

Oak Ridge National Lab., Tenn.
RADIATION ACCIDENTS: MEDICAL ASPECTS OF NEUTRON AND GAMMA-RAY EXPOSURES, by N. Wald and G. E. Thoma, Jr. Rept. on Contract W-7405-eng-26. 180p.

PB 155 675 $1.10

Radiobiological Lab., U. of Texas, Austin.
RADIOPROTECTION IN PRIMATES. A PRELIMINARY REPORT, by George S. Melville, Jr., Richard E. Benson and others. Jan 61, 9p. 11 refs. AFSAM rept. 61-3; AD-254 062.

DESCRIPTORS: *Primates, *Radiation effects, Countermeasures, *Chemotherapeutic agents, Drugs, Dosage, X-rays, Effectiveness.

In preliminary studies, the radioprotective drug S,beta-aminoethylisothiuronium dibromide (AET) was administered to Macaca mulatta monkeys receiving four distinct acute doses of x-irradiation which would be 75 to 100 percent lethal in untreated animals. AET was given intravenously, intraperitoneally, and orally. In spite of the small numbers of animals studied, the results indicated the following conclusions: (1) AET given intraperitoneally is not effective at doses above 625 r. (2) AET given intravenously is 50 percent effective at 700 r. (3) Pentobarbital sodium in combination with buffered AET (oral), under certain experimental conditions, may be more effective than either drug alone. (4) The use of cysteine hydrochloride in conjunction with AET appears to potentiate the action of the isothiuronium compound. (Author)

UR-592 $0.75

Rochester U. School of Medicine and Dentistry, N. Y.
DISTRIBUTION AND EXCRETION OF THORIUM WITH EMPHASIS UPON ROUTE OF INJECTION AND AMOUNT OF CARRIER PRESENT, by R. G. Thomas. Rept. on Contract W-7401-eng-49. 3 Apr 61, 27p.

UR-591 $0.50

Rochester U. School of Medicine and Dentistry, N. Y.
EFFECTS OF PROTEIN DEPLETION ON THE LETHALITY OF WHOLE OR PARTIAL BODY X-IRRADIATION OF THE RAT, by A. L. Carsten and T. R. Noonan. Rept. on Contract W-7401-eng-49. 24 Feb 61, 9p.

PB 155 635 $7.60

School of Aviation Medicine [Brooks AFB] Tex.
OCULAR EFFECTS OF THERMAL RADIATION FROM ATOMIC DETONATION: FLASHBLINDNESS AND CHORIORETINAL BURNS, by Victor A. Byrnes, D. V. L. Brown and others. Rept. on Operation Upshot-Knothole. 30 Nov 55, declassified 12 Dec 59, 71p. 143 refs. WT-745.

DESCRIPTORS: *Atomic bomb explosions, *Thermal radiation, Physiology, Eye, *Flash burns, *Blindness, Explosions.

The present project was designed to determine the effect of the flash of atomic detonations at night upon the ability of military personnel to carry out their assigned tasks when such tasks involve the use of vision. It is considered that in general three types of visual tasks are involved in military operations: (a) reading of instruments in ships, aircraft, tanks, and vehicles; (b) central acute vision at low levels of illumination; and (c) peripheral vision at very low levels. After an atomic flash each individual involved in such military visual tasks would attempt to return to seeing under the light level then available to him. The time required for him to see under each of these circumstances was determined. When the eye observes an atomic fireball, the energy received in the retinal image per unit time and area depends on the relative opening of the eye (pupillary diameter divided by focal length) and the energy emitted by the fireball per unit area. Due to the concentration of energy in the image formed on the retina, skin burns and retinal burns follow different laws. As a result of this concentration retinal lesions are produced at distances many times greater than those for minimal skin burns.

PB 155 601 $1.60

Yale U., New Haven, Conn.
THE ACTION OF FAST CARBON AND HEAVIER IONS ON BIOLOGIC MATERIALS. INACTIVATION OF DRIED ENZYMES, by G. W. Dolphin and Franklin Hutchinson. Dec 60, 11p. 17 refs. AFSAM rept. 60-56; AD-254 061.

DESCRIPTORS: Biophysics, *Enzymes, *Carbon, Accelerators, Heavy elements, Ion accelerators, *Ions, *Trypsin, Electrons, Oxygen, Fluorine, Radiation effects, Theory, *Organic materials.

The dry enzymes β-galactosidase and trypsin were inactivated by carbon, oxygen, and fluorine ions with an energy of 10 Mev per atomic mass unit. The results are intelligible if one considers the ionization produced by a heavy ion to consist of a heavily ionized track which inactivates everything through which it passes, and a surrounding cloud of δ-electrons, the

density of which varies as the square of the charge on the ion. The biologic effect of the δ-electrons can be calculated (either by Lea's associated volume method or by the method worked out in this paper) on the assumption that a single ionization produces inactivation of a single molecule. The good agreement between theory and experiment is impressive evidence for the validity of target theory for this case, and shows that no additional mechanism for inactivation by these heavily ionizing particles needs to be invoked. (Author)

PB 155 674 $1.10

Yale U., New Haven, Conn.
DOSIMETRY AND TECHNIC FOR THE IRRADIATION OF BIOLOGIC SAMPLES WITH HEAVY IONS, by Franklin Hutchinson. Dec 60, 7p. 2 refs. AFSAM rept. 60-55; AD-254 367.

DESCRIPTORS: *Dosimeters, Ions, *Radiation effects, Heavy elements, Ion accelerators, Design, Calibration, Biophysics, *Organic materials.

This report describes a system of dosimetry employed in the radiation of biologic samples in the Yale heavy ion linear accelerator (Hilac). The physical apparatus required and the dosimetry problems involved are presented in detail.

CHEMISTRY

PB 155 141 $1.60

Milan U. (Italy).
NEW RHENIUM COORDINATION COMPOUNDS WITH LOW OXIDATION STATES, by Lamberto Malatesta. Technical (scientific) note no. 4 on Contract AF 61(052)83. 20 Sep 60, 18p. AFOSR-TN-60-1077; AD-252 354.

DESCRIPTORS: *Rhenium compounds, *Complex compounds, Synthesis, Iodides, Cyanides, Chemical reactions, Chemical bonds.

The preparation and properties of a number of new complexes of rhenium (I), (II) and (III) with π bonding ligands are described. Of rehenium(I), the compounds $Re(PR_3)_2(RNC)(CO)X$ and $Re(PR_3)_2(RNC)_2(CO)X$, ($R = C_6H_5$, X = Cl, Br) were prepared from $Re(PR_3)_2(CO)_2X$ with isocyanides, while the analogous $Re(PR_3)_2(CO)_2X$ (X = Cl, Br) was obtained by the direct carbonylation of $Re(PR_3)_2X_2$ at 200 atm and 50-60°C. The divalent salts $[Re(PR_3)_2(RNC)I]X$, (X = I^-, I_3^-, ClO_4^-, BR_4^-), were prepared from $Re(PR_3)_2I_2$ and isocyanides. Finally, the following compounds of rhenium(III) were prepared: $ReX_3(RNC)$ (X = Cl, I) from ReX_3 and RNC, and $ReI_3[P(OR)_3]_3$ from K_2ReI_6 and triarylphosphites. All these compounds are well crystallized and stable substances. (Author)

MLM-1109 $0.50

Mound Lab., Miamisburg, Ohio.
EXPANSION OF A 2 X 2 LATIN SQUARE INTO A 2 X 2 X 2 FACTORIAL EXPERIMENT: A STUDY IN METAL DISTILLATION, by M. K. Barnett. Rept. on Contract AT-33-1-GEN-53. 17 May 61, 21p.

ORNL-3107 $0.75

Oak Ridge National Lab., Tenn.
CONCENTRATION OF SETTLED BEDS OF THORIA SLURRY, by D. M. Eissenberg. Rept. on Contract W-7405-eng-26. 28p.

ORNL-3023 $0.50

Oak Ridge National Lab., Tenn.
CONSOLIDATED EDISON FUEL LOSSES ON EXPOSURE TO IRRADIATED AND AERATED SULFEX AND DAREX DECLADDING SOLUTIONS, by T. A. Gens. Rept. on Contract W-7405-eng-26. 16p.

ORNL-3076 $0.50

Oak Ridge National Lab., Tenn.
EFFECT OF ACCELERATION FORCE ON THE SETTLING RATES OF FLOCCULATED THORIA SUSPENSIONS, by D. M. Eissenberg. Rept. on Contract W-7405-eng-26. 22p.

ORNL-3093 $0.50

Oak Ridge National Lab., Tenn.
IN-PILE MEASUREMENT OF THE ELECTRICAL RESISTIVITY AND THERMOELECTRIC POWER OF SINTERED UO_2, by M. D. Karkhanavala and R. M. Carroll. Rept. on Contract W-7405-eng-26. 11p.

ORNL-3022 $0.50

Oak Ridge National Lab., Tenn.
MEASUREMENT OF HAZARDOUS COMPONENTS OF DAREX PROCESS OFF-GAS, by T. A. Gens. Rept. on Contract W-7405-eng-26. 14p.

ORNL-2976 $0.75

Oak Ridge National Lab., Tenn.
MULTIKILOCURIE PRODUCTION OF KRYPTON-85, by R. E. McHenry. Rept. on Contract W-7405-eng-26. 27p.

ORNL-3055 $0.50

Oak Ridge National Lab., Tenn.
RECOVERY OF Np-237 BY AN OXIDATION-REDUCTION FLUORIDE PRECIPITATION METHOD, by R. D. Baybarz. Rept. on Contract W-7405-eng-26. 9p.

ORNL-3072 $0.75

Oak Ridge National Lab., Tenn.
SULFEX PROCESS: ENGINEERING-SCALE SEMI-CONTINUOUS DECLADDING OF UNIRRADIATED STAINLESS STEEL-CLAD UO_2 AND UO_2-ThO_2, by B. C. Finney and B. A. Hannaford. Rept. on Contract W-7405-eng-26. 32p.

Organic Chemistry

PB 154 441 $8.10

Birbeck Coll. (Gt. Brit.)
ALKYL AND ARYL DERIVATIVES OF THE PHOSPHONITRILIC HALIDES, by R. A. Shaw. Annual technical status rept. no. 2, 1 Oct 59-30 Sep 60, on Contract DA 91-591-EUC-1268. 5 refs. AD-250 870.

DESCRIPTORS: *Phosphonitrile chlorides, Phenyl radicals, Alkyl radicals, *Friedel-crafts reactions, Halides, Chemical reactions, Lithium compounds.

The Friedel-Crafts reaction between phosphonitrilic chloride and aromatic hydrocarbons has been studied in detail. Reactive hydrocarbons do not condense with $(PNCl_2)_3$ in the absence of a catalyst under the conditions so far investigated. Reactivity in the phenyl-substituted trimer series is being studied. The preparation of a 1, 1, 3, 3, 5-type penta-substituted derivative of the trimeric chloride is reported. The reaction between trimeric phosphonitrilic chloride and n-butyllithium is dependent upon the solvent system employed; information is given based on results obtained with (a) a mixed solvent (pentane-ether), and (b) a pure saturated hydrocarbon (pentane). The reactivity of the system P-N-P towards lithium alkyls is at least as complex, if not more so, than the analogous C-N-C grouping of organic heterocycles.

PB 155 142 $1.10

Milan U. (Italy).
SUBSTITUTION REACTIONS OF POTASSIUM PENTAIODOCARBONYLIRIDIATE (III) WITH AMMONIA AND ALIPHATIC AMMINES, by Lamberto Malatesta and Luciana Naldini. Technical (scientific) note no. 5 on Contract AF 61(052)83. 20 Sep 60, 10p. AFOSR-TN-60-1078; AD-252 355.

DESCRIPTORS: *Substitution reactions, Potassium compounds, *Iridium compounds, Ammonia, *Ammine compounds, Carbonyl radicals, *Complex compounds, Chemical reactions.

$K_2[Ir(CO)I_5]$ reacts in the cold with ammonia and primary aliphatic ammines, in the molar ratio 1 : 1, to give complex anions of the type $[Ir(CO)LI_4]$, (L = NH_3; $C_2H_5NH_2$; iso, $C_3H_7NH_2$), which were isolated as tetraphenilarsonium salts. With an excess of the ligand, $K_2[Ir(CO)I_5]$ gives in the cold the non-ionic trivalent compounds of the type $Ir(CO)L_2I_3$, while on warming the divalent derivatives $[Ir(CO)L_3I_2]$ are formed. (Author)

PB 154 361 $2.60

Northwestern U., Evanston, Ill.
HYDROGENATION OF 3, 3-DIMETHYL-1, 4-PENTADIENE ON NICKEL CATALYSTS. A TEST OF THE DEGREE OF DIFFUSIONAL CONTROL IN CATALYTIC HYDROGENATIONS, by Remolo Ciola, John Carter and others. Final rept. on Contract AF 18(603)132. Jan 61, 28p. 12 refs. AFOSR-93; AD-250 207.

DESCRIPTORS: *Hydrogenation, *Catalysis, *Nickel catalysts, Surface properties, Diffusion, Adsorption, Methyl radicals, *Pentadienes, Catalysts.

On nickel wire and on nickel-silica catalysts in the vapor phase and on nickel-silica in the liquid phase, the two double-bonds of 3, 3-dimethyl-1, 4-pentadiene appear to hydrogenate independently. In the absence of diffusional control, 3, 3-dimethylpentene is the only initial product. If substantial concentration gradients in the catalyst pores lead to diffusional control, 3, 3-dimethylpentane appears as an apparent initial product and its initial ratio to dimethylpentene constitutes a measure of the degree of diffusional control introduced by hydrocarbon concentration gradients. Under the conditions employed in the vapor phase reaction, such gradients were small or negligible for oxidized nickel wire, large on 40-60 mesh nickel-silica and still larger on 20-40 mesh nickel-silica. In the liquid phase at room temperatures on 100-200 mesh nickel-silica, the concentrations gradients of olefin were small but those of hydrogen appeared to introduce a serious degree of diffusional limitation. In the liquid phase, the ratio of the rate constants of hydrogenation of the diene and of the mono-ene was about 9 and the ratio of 3, 3-dimethylbutene and 3, 3-dimethylpentene was 1.6. Assuming that the kinetic forms for the rates of hydrogenation of diene and mono-ene are identical, a kinetic treatment of the course of hydrogenation is derived as a function of the initial ratio of mono-ene to alkane. (Author)

PB 156 104 $6.60

Ohio State U. ResearchFoundation, Columbus.
STRUCTURES OF TRINITRO-AROMATIC CRYSTALS AND RELATED SUBSTANCES, by P. M. Harris. Final rept. on Contract AF 18(600)1371. Sep 59, 70p. 20 refs. Rept. 622; AFOSR-TR-59-165; AD-228 781.

DESCRIPTORS: *Nitrobenzenes, *TNT, *RDX, *Explosives, Molecular structure, Crystal structure, Chlorides, Lead compounds, *Styphnates.

Determinations were made of the molecular and crystal structures of trinitro-derivatives of benzene and related explosives, including sym-trinitrobenzene, RDX, TNT, picryl chloride, and lead styphnate.

Physical Chemistry

PB 154 908 $1.60

Alabama U., University.
A STUDY OF THE CHEMISTRY OF NIOBIUM AND ITS RELATED ELEMENTS, by James L. Kassner. Final rept. on Contract AF 18(600)1567. 31 July 60, 17p. 16 refs. AFOSR-TR-60-99; AD-251 857.

DESCRIPTORS: *Niobium, *Transition elements, *Rhenium, Complex compounds, Chelate compounds, Chemical analysis, Determination, *Reagents, Ultraviolet spectrophotometers, Spectrographic analysis, *Oximes, Ultraviolet spectroscopy, Chemical properties, Chemical reactions.

The possibility of using 4-methylnioxime as a chelating reagent for Re was explored. The method developed was based on the formation of a soluble, stable, yellow-green rhenium-4-methylnioxime chelate, where Re (VII) is reduced by SnCl2 in a dilute HCl solution in the presence of 4-methylnioxime. The calculated molar extinction coefficient for rhenium-4-methylnioxime is about 68,900, compared to less than 45,000 reported for other methods for Re. This method is applicable to the spectrophotometric determination of less than 0.001% of Re in molybdenite concentrate and in molybdenite roaster flue dust. Interfering elements were removed by evaporation with HCl, hydrous oxide precipitation with NH3 and organometallic compound formation with ethyl xanthate, and extraction from a dilute HCl solution with chloroform.

ANL-6335 $0.75

Argonne National Lab., Ill.
A STUDY OF THE EMANATION METHOD FOR THE DETERMINATION OF THE SURFACE AREA OF THORIUM OXIDE, by S. B. Skladzien. Rept. on Contract W-31-109-eng-38. Apr 61, 31p.

PB 155 107 $2.60

Cincinnati U., Ohio.
THE KINETICS AND MECHANISM OF THE REACTION OF BOROHYDRIDES WITH WEAK ACIDS, by Raymond E. Dessy and Edward Grannen, Jr. Rept. on Contract AF 49(638)824. Nov 60, 24p. 25 refs. AFOSR TN-60-1467; AD-252 173.

DESCRIPTORS: *Reaction kinetics, *Chemical reactions, Borohydrides, Phenols, Alkali metal compounds, Acids, Isotopes, Lithium compounds, Sodium compounds, Deuterium.

Data are given for the following: (1) the mechanism of the reaction of sodium borohydride with phenols in diglyme, (2) reaction of lithium borohydride with various weak acids in diglyme, and (3) deuterium isotope effects in these systems. Reaction (1) obeyed the rate law of $d(H_2)/dt$ equals to k(phenol squared) $(NaBH_4)$/(sodium phenoxide). Evidence indicated that $\phi OH_2^{(+)}$ is the attacking species; k_H/k_D (phenol) is 1.7. The reaction of $LiBH_4$ with CH_3OH is similar; k_H/k_D ($LiBH_4$) is 0.63. These isotope effects, in addition to the fact that the rate of reaction of $LiBH_4$ with HA increases along the series C_5H_6, C_4H_5N, tert-BuOH, CH_3OH, as HA is varied, while the k_a's of the acids increase along the series C_4H_5N, tert-BuOH, CH_3OH, C_5H_6, suggests a four center transition state for the reactions. (Author)

PB 155 474 $3.60

Clarendon Lab., U. of Oxford (Gt. Brit.)
MAGNETIC SUSCEPTIBILITIES OF ERBIUM AND HOLMIUM ETHYLSULPHATES, by A. H. Cooke, R. Lazenby and M. J. M. Leask. Technical (Scientific) note no. 2 on Contract AF 61(052)92. June 60, 31p. 17 refs. AFCRL-83; AD-253 433.

DESCRIPTORS: Erbium compounds, Holmium compounds, *Sulfates, Ethyl radicals, *Magnetic susceptibility, *Rare earth compounds.

The magnetic susceptibilities of erbium ethylsulphate and holmium ethylsulphate have been measured at temperatures between room temperature and 1.3°K. The results are compared with the values calculated from paramagnetic resonance data, and good agreement is obtained. The susceptibility of the erbium salt at low temperatures can be accounted for by a ground doublet having $g_{\parallel} = 1.58 \pm 0.05$ and $g_{\perp} = 8.53 \pm 0.05$, with the lowest excited states some 50 cm^{-1} above the ground doublet. The susceptibility of the holmium salt in the helium range of temperatures can be accounted for by a triplet ground state having $g_{\parallel} = 7.70 \pm 0.05$ and $g_{\perp} = 3.86 \pm 0.05$, split into a doublet and a singlet, the singlet being 5.5 cm^{-1} above the doublet. The Jahn-Teller splitting of the doublet is not more than 0.1 cm^{-1} (Author)

PB 155 545 $3.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
A STUDY OF THE ALTERATION OF WATER DROPLET SUPERCOOLING BY FOREIGN VAPORS, by Warren P. Hendrix, F. Kenneth Hurd and Clyde Orr, Jr. Final rept. on Contract AF 19(604)4970. 28 Feb 61, 34p. 11 refs; AD-253 798.

DESCRIPTORS: *Drops, Freezing, *Water vapor, Gases, Temperature, Determination, Contamination, Nitrogen, Vapors.

An investigation was made of water vapor supercooling using an expansion chamber technique. The temperature of spontaneous droplet freezing was determined with small percentages of various contaminants in an otherwise pure nitrogen atmosphere. The temperature of the ambient gas at the time of freezing was used to establish the droplet temperature. A calculation of temperature rise during an expansion due to heat leaking in from the walls of the chamber was made to test the assumption that the droplets have sufficient time to reach thermal equilibrium with the gases. It was found that sufficient time did indeed occur, therefore the freezing temperature of the droplets could be satisfactorily calculated from expansion data. The freezing temperature of the water droplets produced by a rapid pressure reduction in a pure nitrogen atmosphere was found to be $-45.5^{\circ} \pm 0.4^{\circ}$ C. The vapors of ethylamine and turpentine in less than one per cent quantities produced a decisive lowering of this freezing temperature. Freezing temperatures in the presence of all the other gases and contaminants investigated, including argon, nitric oxide, nitrous oxide, carbon dioxide, n-butanol, ethanol, aniline, a-pinene, 1- pentene, and 2-methy-2-butene, were very near that of a pure nitrogen atmosphere. (Author) (See also PB 147 488)

PB 154 730 $6.60

Miami U., Oxford, Ohio.
X-RAY STUDIES OF SALT SOLUTIONS, by Howard L. Ritter. Rept. on Contract AF 18(600)485. Dec 60, 66p. 7 refs. AFOSR-46; AD-253 967.

DESCRIPTORS: *Solutions, *Molecular structure, *Sterochemistry, *X-ray diffraction analysis, Liquids, X-ray diffraction cameras, *Crystal structure, *Salts, Phase studies, Chemical reactions, Water, Iodides, Barium compounds, Cadmium compounds.

Since the majority of chemical processes take place in the liquid state, ignorance of the exact geometrical nature of the participating species is a distinct handicap to the study of chemical reactions. Even in water, the most common vehicle for reactions in solution, the structure of simple ions is very uncertain. The research presented here was originally projected to explore the possibility of using X-ray diffraction methods to elucidate the structures of simple species in solution.

PB 155 140 $2.60

Milan U. (Italy).
ELECTROCHEMICAL BEHAVIOUR OF OXYGEN AND HYDROGEN PEROXIDE ON TITANIUM ELECTRODES, by G. Bianchi, G. Caprioglio and others. Technical (scientific) note no. 2 on Contract AF 61(052)260. 30 Aug 60, 30p. 15 refs. AFOSR-TN-60-859; AD-252 353.

DESCRIPTORS: Electrochemistry, *Titanium, *Electrodes, Oxygen, Hydrogen compounds, Peroxides, Reduction, Polarization, *Cathodes (Electrolytic cell).

The electrochemical behaviour of O and H_2O_2 on Ti electrode was studied by means of polarization curves. Ti is an efficient electrodic material for the cathodic reduction of O and H_2O_2. The tension at which the cathodic reduction of O occurs is almost independent from the pH. The behaviour of Ti as regard the electrochemical processes of O_2 and H_2O_2 is comparable to that of other metals like Ag and Au, in acid and neutral solutions. In alkaline solution the reversible reaction O_2 yields H_2O_2 occurs at tension about + 100/+200 mV (NHS) on many metals (Pt, Ag, Au, graphite). On the contrary on the Ti the reaction occurs at a less noble tension (- 300 mV NHS). (Author)

ORNL-3088 $0.50

Oak Ridge National Lab., Tenn.
MEASUREMENT OF DISSOCIATION PRESSURE OF MOLYBDENUM FLUORIDE-SODIUM FLUORIDE COMPLEX, by F. R. Groves, Jr. Rept. on Contract W-7405-eng-26. 17p.

ORNL-2770 $0.50

Oak Ridge National Lab., Tenn.
PRODUCTION OF URANIUM METAL FROM UF_6 BY DIRECT REDUCTION WITH LITHIUM OR SODIUM AMALGAM, by O. C. Dean. Rept. on Contract W-7405-eng-26. 23p.

ORNL-3084 $0.50

Oak Ridge National Lab., Tenn.
SOLUBILITIES OF URANYL AND IRON (III) DIBUTYL AND MONOBUTYL PHOSPHATES IN TBP SOLVENT EXTRACTION SOLUTIONS, by W. Davis, Jr. Rept. on Contract W-7405-eng-26. 15p.

IDO-14543 $0.50

Phillips Petroleum Co., Idaho Falls.
BASIC STUDIES OF CHEMICAL STABILITY IN EXTRACTION SYSTEMS. I. THE EFFECT OF ZIRCONIUM NITRATE AND NITRIC ACID UPON THE CHEMICAL STABILITY OF TRIBUTYL PHOSPHATE, by A. J. Moffat and R. D. Thompson. Rept. on Contract AT(10-1)-205. 14 Apr 61, 17p.

IDO-14545 $0.50

Phillips Petroleum Co., Idaho Falls.
PLANT TESTS ON THE DECOMPOSITION OF NITROUS OXIDE OVER A HEATED RHODIUM CATALYST, by L. T. Lakey. Rept. on Contract AT(10-1)-205. 17 Apr 61, 9p.

DP-573 $0.50

Savannah River Lab., Aiken, S. C.
A POLAROGRAPHIC TEST FOR SOLVENT QUALITY, by R. C. Propst. Rept. on Contract AT(07-2)-1. Apr 61, 11p.

PB 155 134 $2.60

Technical U. of Norway, Trondheim.
AN ATTEMPT TO DETERMINE THE STRUCTURE PARAMETERS OF CONDENSED RING HYDROCARBONS USING THE ELECTRON DIFFRACTION METHOD IN GAS MOLECULES, by Otto Bastiansen. Rept. on Contract AF 61(052)72. 23 Nov 60, 24p. 11 refs. AFOSR TN-60-1260; AD-252 439.

DESCRIPTORS: *Naphthalenes, *Anthracenes, *Polycyclic compounds, *Molecular structure, Gases, Molecules, Electron diffraction analysis, Chemical bonds, Hydrocarbons.

Electron diffraction studies have been carried out to determine the molecular structure of naphthalene, anthracene, and coronene, using least-squares refinement. For naphthalene a set of structure parameters are obtained of approximately the same accuracy as those from the X-ray crystallographic studies. For anthracene the present study leads to ambiguity, and no single set of parameters can be presented. For coronene the investigation leads to a unique set of values for the C-C bond distances, but the standard deviations are so large that at least two of the distance values must be considered as rather uncertain. (Author)

PB 156 113 $2.60

Ultrasonic and Electrochemistry Research Lab., Western Reserve U., Cleveland, Ohio.
THE CATHODIC POLARIZATION ASSOCIATED WITH THE OXYGEN ELECTRODE, by Ernest Yeager, R. R. Witherspoon and others. Technical rept. no. 2 on Contract Nonr-581(00). 15 Mar 53, 23p. 9 refs. AD-7654.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Primary batteries, *Electrodes, *Polarization, *Oxygen electrodes, Ultrasonics, Electrochemistry.

Cathodic polarization measurements were made by the commutator technique with O on partially waterproofed active C electrodes in an alkaline solution. The results indicated that even at appreciable current densities, the electrochemical conversion of adsorbed O to the perhydroxide ion is essentially reversible. The rate-determining steps are primarily associated with the conversion of gas-phase O to adsorbed O and the removal of excess perhydroxide ions from the solution-electrode interface through diffusion, electrolytic transport, and/or decomposition. Conclusions regarding the use of O cathodes in primary batteries indicate that cathodic polarization is not excessive for battery operation at current densities as high as 100 amp/sq ft if pure O is used. The use of a specific catalyst in the C electrode to decompose perhydroxide ions yields superior performance in terms of potential and efficiency. At high current densities, cathodic polarization decreases with increasing conductivity of the basic solution. Partial waterproofing is required for the C electrodes because of the low solubility of O in aqueous solutions. The degree of waterproofing is critical for a particular electrolyte and represents a compromise between low polarization and long performance.

EARTH SCIENCES

PB 155 705 $23.50

Aero Service Corp., Philadelphia, Pa.
TERRAIN ANALYSIS OF ICE-FREE LAND SITES IN ARCTIC CANADA, by Albert E. Pressman, Richard L. Stitt and others. Final rept. on Contract AF 19(604)6182. Feb 61, 490p. 98 refs. Rept. no. 0047-30; AFCRL-206; AD-253 701.

DESCRIPTORS: *Terrain, Arctic regions, Canada, Analysis, *Climate, Geology, *Landing fields, Aircraft.

The major purpose of this project was the identification, location and preliminary terrain analysis of the most promising ice-free natural landing sites within the Canadian Arctic, north of the 65th parallel. This analysis, for the most part, devotes itself to the written and graphic description of the 50 ice-free landing sites located within the area.

PB 156 336 $6.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
GEODIMETER, MODELS I AND II, by C. Edward Westerman. Rept. for Jan 53-Dec 56. 21 Aug 57, 64p. Technical rept. 1495-TR: AD-143 086.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Range finding, Instrumentation, Measurement, *Mapping, Geodesy, Light, Reflection, Tests.

This report covers the tests, modifications, and evaluation of large, precise Geodimeters, Models I and II, to determine their suitability for use by the Corps of Engineers and User Agencies in establishing and advancing first-order control. Included are tests under laboratory, normal field, arctic, and desert conditions; studies of reflector systems, tower mounting of instruments, modification of equipment by the contractor to correct design deficiencies; and the procurement of Geodimeters for the Army Map Service, Inter-American Survey, and the U. S. Coast and Geodetic Survey, Manuals were prepared and operating and maintenance instructions were given to personnel of the Army Map Service, the U. S. Coast and Geodetic Survey, and Ordnance Corps, and the Navy Hydrographic Survey. The report concludes that: (a) Both Model I and II Geodimeters are capable of determining distances to the order of accuracy required for first-order baseline measurements (1/300,000) when the length is greater than 3 mi; for distances from 1 to 3 mi, second-order accuracy (1/150,000) is assured, and with additional observations, first-order results can be approached; (b) The Geodimeters meet the military characteristics, except as indicated in Appendix C, and have many advantages over conventional first-order taping methods in measuring baselines or other precise distances. (Author)

Climatology and Meteorology

PB 155 659 $3.60

Aeronautical Icing Research Labs., Bartlett, N. H.
FOG STUDIES AT ARCATA, CALIFORNIA UNDER "OPERATION PEA SOUP" 1960, by G. P. Ettenheim, Jr., J. B. Howe, and D. B. Lockwood. Rept. for 15 Feb 60-14 Feb 51 on Contract AF 19(604)7210. Mar 61, 38p. 18 refs. Technical note no. 570; AFCRL-261; AD-254 105.

DESCRIPTORS: *Fog, California, Analysis, Instrumentation, Punched card methods, Visibility, Meteorological radar.

PB 154 888 $9.10

Air Force Cambridge Research Labs., Bedford, Mass.
CONTRIBUTIONS TO STRATOSPHERIC METEOROLOGY, VOLUME II, by Thomas R. Borden, Jr. Wayne S. Hering and others. Rept. for Aug 58-Apr 60. Sep 60, 107p. 49 refs. GRD Research Notes no. 1; AFCRL-TN-60-689; AD-250 586.

DESCRIPTORS: *Stratosphere, Temperature, *Wind, Weather forecasting, Meteorological data, Tables.

Contents:
On the general circulation of the stratosphere
The correspondence in stratospheric and tropospheric flow patterns
The mean temperatures at the 20, 15, and 10-mb levels
The wind field at 100,000 ft during 1957 and 1958
Relationships between ozone and meteorological parameters in the lower stratosphere

Assessment of the wind forecasting problem in the stratosphere
A most surprising discovery (a historical note on the tropopause)
(See also PB 151 327)

PB 154 897 $3.60

Air Force Cambridge Research [Labs.] Bedford, Mass. HYPSOMETER FOR CONSTANT LEVEL BALLOON, by Walter C. Wagner. June 60, 35p. 5 refs. Instrumentation for Geophysics and Astrophysics no. 14; AFCRC-TR-60-262; AD-250 583.

DESCRIPTORS: *Hypsometers, Design, Barometric pressure, Measurement, Stratosphere, Balloons, Operation, Experimental data, Effectiveness.

A recently-developed hypsometer was made to measure atmospheric pressures in the stratosphere during balloon flights of 5 to 12 days duration. Design considerations, various performance data, and sources of error are discussed. In this instrument a pure liquid is electrically preheated to its boiling point and the atmospheric pressure is determined from the known boiling temperature-pressure characteristic of the liquid. Temperature is detected by a bead thermistor whose resistance is measured at predetermined intervals by a modified Wheatstone bridge, and the data are telemetered. Results indicated that the hypsometer was an accurate and highly sensitive device for determining low pressures. An improved model, in which the low-pressure range and duration time are extended and the calibration and data-reduction procedures simplified, is ready for flight test. (Author)

PB 154 889 $1.10

Air Force Cambridge Research Labs., Bedford, Mass. WIND SPEEDS FROM GMD-1 ASCENTS COMPUTED ELECTRONICALLY COMPARED TO PLOTTING BOARD RESULTS, by Henry A. Salmela. Oct 60, 10p. 5 refs. GRD Research Notes no. 47; AFCRL-TN-60-804; AD-250 861.

DESCRIPTORS: Upper atmosphere, *Atmospheric sounding, *Wind, Measurement, *Electronic recording systems, Height finding, Plotting boards.

For 30 upper-wind soundings at Montgomery, Alabama, most of the wind speeds evaluated by plotting board in the field for each minute of ascent up to 7 kn, and each even minute above that level up to 16 km, differ only slightly from the corresponding speeds evaluated for each identical interval by an electronic computer. The differences increase with height, but even at 50,000 ft the median absolute difference is only 1.6 m/sec. Some individual differences are large enough to raise questions about the accuracy of winds computed by present methods for the upper portions of some flights. (Author)

PB 155 593 $3.60

Florida State U. [Tallahassee].
THE STRATOSPHERIC WARMING OVER NORTH AMERICA IN 1957. I. HEIGHT, TEMPERATURE, VELOCITY, AND VERTICAL MOTION AT THE 100-mb SURFACE, by Richard A. Craig, M. A. Lateef and R. A. Mitchem. Scientific rept. no. 1 on Contract AF 19(604)5471. 1 Apr 61, 36p. 8 refs. AFCRL-279; AD-254 009.

DESCRIPTORS: *Stratosphere, Heating, Temperature, Vortices, Turbulence, Motion, North America.

This report outlines briefly the assumptions and procedures being used to compute various meteorological parameters at half-day intervals at a series of grid points over North America and the adjacent North Atlantic. Distributions of height, temperature, relative vorticity and vertical motion at the 100-mb surface are displayed at intervals of 48 hours throughout the period, and the evolution of these distributions is discussed. (Author)

PB 155 894 $5.60

Geophysical Inst., U. of Alaska, College.
THE AVERAGE MORPHOLOGY OF GEOMAGNETIC STORMS WITH SUDDEN COMMENCEMENT, by Masahisa Sugiura and Sydney Chapman. Scientific rept. no. 2 on Contract AF 19(604)2163. Mar 61, 53p. 18 refs. AFCRL-272; AD-254 915.

DESCRIPTORS: *Magnetic storms, Harmonic analysis, Storms, Magnetism, Intensity, Analysis.

This paper describes the average morphology of geomagnetic storms with sudden commencement. A numerical intensity index was assigned to each of 346 storms occurring in 1902 – 45. On the basis of these indices the storms were divided into three sets, of 136 weak, 136 moderate, and 74 great storms. Their morphology was studied separately. For weak storms records were analyzed from 26 magnetic observatories, ranging in geomagnetic latitude from 80°N to 48°S; and for moderate and great storms, from 10 observatories, 80°N to 1°S. The storm-time variation Dst and the disturbance longitudinal inequality DS were determined for the first three storm days for different latitudes. The DS variation was obtained, and harmonically analyzed, for each of the first eight quarter-day intervals and for the succeeding three 8-hour intervals. New features of storm morphology during the first few hours of storm time were discovered: namely, that DS reaches its maximum in about two or three hours from the storm commencement, and that its phase rapidly changes during the first few storm hours. In other respects the results confirm those previously obtained by Chapman, and much extend them. At Huancayo, nearly on the magnetic equator, some features of the storm field are found to be abnormal. (Author)

PB 155 600 $4.60

Hawaii Inst. of Geophysics, Honolulu.
AN INVESTIGATION INTO THE RELATIONSHIP OF MONTHLY CIRCULATION INDICES AND ANOMALIES TO TYPHOON DEVELOPMENT (IN THE WESTERN PACIFIC) by M. M. Orgill. Scientific rept. no. 2 in Contract AF 19(604)7229, continuation of Contract AF 19(604)1942. Aug 60, 47p. 15 refs. AFCRL-TN-60-834; AD-253 496.

DESCRIPTORS: *Tropical cyclones, Wind, *Weather forecasting, Pacific Ocean, Marine meteorology.

Evidence is presented which indicates that a strong contributing factor for the frequency maximum in the

Western Pacific area is its favorable position with respect to an active cyclogenetic region near the Bering Sea-Aleutian Island area. Monthly typhoon incidence was found to be significantly correlated with pressure-height anomalies in this region. The position and intensity of the western section of the subtropical ridge were also related to typhoon frequency but to a lesser extent. A modified Hovmoller diagram was prepared and analyzed for the 1956 typhoon season in order to examine on a daily synoptic basis the relationships derived from monthly mean data. The results suggests that there is an interaction between intensifying distal troughs in the circumpolar westerlies and troughs in the easterlies such that perturbational energy released into the easterlies is propagated through amplification of downstream troughs and ridges. (Author)

PB 156 101 $2.23

Hydrodynamics Lab., U. of Chicago, Ill.
STUDIES IN EXPERIMENTAL HYDRODYNAMIC ANALOGUES OF THE ATMOSPHERE, by Dave Fultz. Final rept. for 1 July 55-31 Aug 58 on Contract AF 19(604)1292. Dec 58, 223p. 345 refs. [AFCRC] TR-59-204; AD-211 199.

DESCRIPTORS: *Atmosphere, *Hydrodynamics, Jet streams (Meteorology), *Convection.

The completed papers included in the report represent detailed results attained in the study of rotating thermal convection in cylindrical disks (dishpans) or annuli.

PB 155 186 $4.60

Illinois State Water Survey, Urbana.
RADAR INVESTIGATIONS OF ILLINOIS HAILSTORMS, by Kenneth E. Wilk. Scientific rept. no. 1 on Contract AF 19(604)4940. 15 Jan 61, 47p. 9 refs. AFCRL-TN-61-202; AD-252 198.

DESCRIPTORS: *Hail, *Storms, Radar analysis, *Radar echo area, *Meteorological radar, Identification systems, Illinois.

The use of radar in the detection and identification of severe thunderstorms was considered. Methods used in the collection of radar and meteorological data for severe local hailstorms are discussed. Results are shown of a comparison between surface hail observations and radar echo intensity measurements for various altitudes. It is suggested that identification of hail-producing thunderstorms is possible in the Midwest by examining the radar echo intensity between 20,000 and 25,000 ft for a radar reflectivity factor exceeding 1 x 100,000 mm raised to the 6th power/cu m. (Author)

PB 155 187 $7.60

Illinois State Water Survey, Urbana.
STUDIES OF RADAR-DEPICTED PRECIPITATION LINES, by Stanley A. Changnon, Jr. and Floyd A. Huff. Scientific rept. no. 2 on Contract AF 19(604)4940. 15 Feb 61, 72p. 12 refs. AFCRL-225; AD-252 197.

DESCRIPTORS: Storms, *Precipitation, Radar analysis, *Meteorological radar, Climatic factors, Detection, Measurement, Illinois

Three separate studies were made: (1) a radar climatological description of precipitation lines as displayed by the CPS-9, (2) a similar investigation using the APS-15, and (3) the radar characteristics of precipitation lines associated with heavy rainstorms. These investigations were made to supplement the limited knowledge available concerning precipitation lines, with particular attention to severe weather phenomena and heavy rainstorms. Data are presented to describe rainfall line characteristics such as movement, orientation, duration, size, and growth tendencies. It was found that severe weather and heavy rainfall lines were larger, persisted longer, moved faster, and rotated more than other lines. (Author)

PB 154 231 $1.60

ITT Federal Labs., Nutley, N. J.
TRADE WINDS DUCT INVESTIGATIONS. Final rept. on Contract AF 19(604)7371. Jan 61, 18p. AFCRL-TR-60-366; AD-249 919.

DESCRIPTORS: *Atmosphere, Ducts, *Radio interference, Very high frequency, Radio signals, Reflection, Tests, Caribbean Sea.

Recent meteorological measurements showed that a duct exists at an altitude of about 5000 ft between the coasts of Africa and Brazil. It is believed that this duct may also exist over a large part of the Trade Wind area. Tests were made between two aircraft flying in the duct. At a distance of 1200 naut mi, transmission loss at 200 mc was only 50 db greater than the theoretical loss. Such an elevated duct could also reflect V VHF radio energy. Since it is desirable to avoid the use of aircraft in a permanent radio link, ITT Federal Laboratories suggested that further transmission tests be made to determine the loss between two ground stations in the Trade Wind area. (Author)

PB 155 109 $2.60

Puerto Rico U., Mayaguez.
SPORADIC-E AS ABSERVED FROM MAYAGUEZ, P. R. BY BACKSCATTER SOUNDERS, by B. Dueno. Research rept. no. 3 on Contract AF 49(638)172. [1959] 23p. 5 refs. AFOSR-35; AD-252 696.

DESCRIPTORS: *Meteorological radar, *Ionospheric propagation, Scattering, Ionosphere, Diurnal variation.

Sporadic - E activity has been recorded at Mayaquez, P. R. (latitude 18-12-25N) using backscatter techniques, from January 1958 to May 1960. Two channels, one on 21.6 Mc/s and another on 40.68 Mc/s were used during the entire period to record this data. In addition, data was obtained on 49.68 Mc/s from July 1959 to May 1960. Data was obtained continuously and was recorded at one minute intervals on 16 mm film. (Author)

PB 155 590 $5.60

Lamont Geological Observatory, Palisades, N. Y.
GEOPHYSICAL AND OCEANOGRAPHIC RESEARCH IN THE ARCTIC OCEAN, by Kenneth Hunkins. Final rept. on Contract AF 19(604)2030. 15 Nov 60, 52p. AFCRL-TR-60-425; AD-253 807.

DESCRIPTORS: Arctic regions, *Oceanography, *Weather stations, Ocean bottom, Sea water, Floating bodies, *Ice, Wave transmission, Oceanographical data, Propagation, Oceans, *Seismic waves, *Geophysics, Instrumentation, Underwater sound transmission.

The use of stations on drifting pack ice for geophysical and oceanographic studies of the Arctic Ocean proved highly successful. The investigations, by Lamont Geological Observatory from Drifting Stations Alpha, Bravo and Charlie provided new information about the environment of the Arctic Ocean. A prominent topographic feature, the Alpha Rise, was delineated and mapped from Station Alpha. The floor of the Arctic Ocean was observed directly for the first time in submarine bottom photographs. Unique deposits of gravel were found on the ocean floor and found to have been ice-rafted from a glacial shore area. Acoustic wave propagation in the ice revealed large seasonal changes in velocity. The Chukchi Rise was delineated in detail with fathograms produced by a precision depth recorder on Station Charlie. Long range deep-water underwater sound transmission was also observed from this station and the results interpreted in terms of normal mode theory. Finally, at Station Bravo, shallow-water underwater sound transmission was observed and found to agree with theory for normal modes propagating in an ice-water-sediment system. (Author)

PB 154 041 $1.10

Visibility Lab., U. of California, San Diego.
ON THE EFFECT OF SUN ALTITUDE ON THE HORIZONTAL DISTRIBUTION OF NATURAL LIGHT UNDERWATER, by J. E. Tyler. Rept. on Contract NObs-72092. Apr 60, 8p. 3 refs. SIO Ref. 60-17; AD-251 820.

DESCRIPTORS: *Underwater illumination, Light, Distribution, Water, Reflection, Diffusion, Oceanography.

Skylighting which is symmetrical about the zenith generates a light vector diagram which is symmetrical about the vertical axis. When the sun departs from a position of symmetry the light vector diagrams become distorted. The extent of this distortion can to some extent be predicted from a knowledge of the scattering and reflecting properties of the water. The method of prediction is explained. (Author)

PB 154 884 $5.60

Air Force Cambridge Research Labs., Bedford, Mass.
EXPLORATION OF THE IONOSPHERE WITH TELEMETERING MONOCHROMATORS AND RETARDING POTENTIAL ANALYZERS, by H. E. Hinteregger. Aug 60, 53p. 17 refs. GRD Research Notes no. 39; AFCRL-TN-60-485; AD-250 581.

DESCRIPTORS: *Ionosphere, Exploration, Rockets, *Telemetering data, *Monochromatic light, Ultraviolet radiation, X-rays, Measurement, Ions, Density, *Mass spectrometers, Sounding rockets.

Rocket measurements of solar extreme ultraviolet and x-ray fluxes are discussed as a new basis for experimental ionospheric research. Much detailed complementary information can be obtained from experiments with retarding potential analyzers particularly those of parallel plane geometry. The analyzer's performance characteristic can be readily used for many different probing objectives including the analysis of highly anisotropic regions of ionospheres and for ion densities as low as that expected for the interplanetary space. (Author)

PB 154 882 $2.60

Air Force Cambridge Research [Labs.] Bedford, Mass.
LAGRANGIAN AND EULERIAN RELATIONSHIPS IN THE ABSENCE OF BOTH HOMOGENEITY AND TIME STEADINESS, by Morton L. Barad and Duane A. Haugen. May 60, 24p. 9 refs. GRD Research Notes no. 32; AFCRC-TN-60-299; AD-240 622.

DESCRIPTORS: *Gas diffusion, Gas flow, Turbulent flow, Determination, Motion, Oscillation, Particles, Airborne, *Atmosphere, Contamination.

For the conditions of homogeneous and statistically steady turbulence, Taylor showed that the variance of the lateral distribution of particles downwind from a continuous point source may be expressed in terms of the Lagrangian correlation coefficient. The significance of the absence of the combination of homogeneity and time steadiness is studied for two cases of atmospheric flow: (1) a single wave travels through the medium, and (2) an oscillation in time, homogeneous with respect to the horizontal space coordinates, occurs. For these cases, the variance of the distribution of the particles in terms of the Lagrangian correlation coefficients can be expressed for only certain values of travel time when the emission time is given. A diffusion experiment conducted in a flow pattern is analyzed, and the Lagrangian-Eulerian relationships discussed. The results of the investigation are applied to the problems of experimental design and post-experiment analysis. (Author)

PB 154 779 $4.60

Electromagnetic Research Corp., College Park, Md.
DETERMINATION OF IONOSPHERE PARAMETERS BY MEANS OF A SATELLITE ANTENNA-TYPE PROBE; II. ANALYSIS FOR SPHERICAL GEOMETRY, by W. W. Zachary. Scientific rept. no. 2 on Contract AF 19(604)6656. 31 Dec 60, 43p. 12 refs. Rept. no. CRC-6656-2; AFCRL-235; AD-251 231.

DESCRIPTORS: *Satellite vehicle research, Satellite vehicles, Spheres, *Ionosphere, *Satellite vehicle antennas, Density, Terrestrial magnetism, Numerical analysis, *Plasma physics, Geometry, Slot antennas.

The analysis of a spherical antenna-type ionosphere probe is given. The change in input admittance upon immersion of the antenna in a magneto-ionic medium is evaluated by expressing the field as the sum of the free-space field and a secondary field. The secondary field is evaluated by successive approximations. Calculations are carried through in detail for the first approximation, Higher order approximations can be evaluated by the same procedure. The analysis is in a form which lends itself to numerical evaluation on a digital computer. (Author)

PB 155 643 $3.60

Geophysical Inst., U. of Alaska, College.
EXPERIMENT LUXEMBOURG, by G. C. Rumi and R. F. Benson. Scientific rept. no. 4 on Contract AF 19(604)3880. Dec 60, 36p. UAG-R111; AFCRL-286; AD-254 226.

DESCRIPTORS: *Ionosphere, Electromagnetic properties, Reflection, Radio waves, Propagation, Modulation, Radio signals, Detection, *Antennas, Polarization, *Radio transmitters, *Radio receivers, *Electronic equipment, Radiofrequency.

Experiment Luxembourg was designed to measure the electron density and electron collision-frequency as a function of height in the D region over College, Alaska using the technique of radio-wave interaction. A block diagram, which includes all the equipment necessary for the actual operation of the experiment, is described and illustrated in detail. The major parts of the system are: the disturbing transmitter operating on 17.5 Mc/s and using a 4x4 array of Yagi antennas, the wanted transmitter operating on ~5 Mc/s and using a circular polarization unit with 4 dipoles arranged in a quadrangle, a similar circular polarization unit and antenna for 5 Mc/s at the receiving site, and the delicate receiving system which detects a cross-modulation of 1×10^{-4} for a one volt input signal. Some values of electron density and collision-frequency have been obtained and will be discussed in following publications. (Author)

PB 171 852 $2.75

Geophysics Corp. of America, Bedford, Mass
THE UPPER ATMOSPHERE, by P. J. Nawrocki, K. Watanabe, and L. G. Smith. Scientific rept. no. 5 on Contract AF 19(604)7405. Feb 61, 137p. 73 refs. GCA technical rept. 61-13-A; AFCRL-73; AD-253 271.

DESCRIPTORS: *Upper atmosphere, Ionosphere, Physical properties, Stratosphere, Density, Ionization.

Contents:
Density and composition
The 1959 ARDC model atmosphere
Fine structure of the atmospheric density (secular variations)
Auroral zones (latitude variation)
Neutral composition
Positive ion composition
Negative ion composition
Ionosphere
Atmospheric parameters (0-60 km)
The D-region
The E and F regions
Solar spectrum
0-2100 A region
Photon flux from sun outside atmosphere in region 1000-20,000 A

PB 155 904 $3.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
AN ANALYSIS OF THE ELECTRON DENSITIES IN REGION F OF THE IONOSPHERE, by E. R. Schmerling and D. Grant. Scientific rept. no. 147 on Ionospheric Research, Contract AF 19(604)4563. 1 Apr 61, 37p. 12 refs. AFCRL-403; AD-254 858.

DESCRIPTORS: *Ionosphere, Analysis, *Electrons, Density, Production.

The electron-density height profiles for the mean quiet ionosphere, corrected for quasi-equilibrium conditions in the absence of movements, are examined in order to determine the parameters which enter into the electron-production and loss functions for region F. The shapes of the profiles are first compared with theoretical curves observed from a model for electron loss with no seasonal change. While the orders of magnitude of the parameters are reasonable, this model requires a scale height for Washington which is greater in winter than in summer. The mechanism for electron loss is then examined. While the change-transfer model is successful in accounting for some of the more striking features observed in region F, marked departures are observed in detail. A hypothesis due to Ratcliffe (1959) is next examined. While the scatter in the measured quantities is so large that no definitive conclusion can be stated, no contradictions are found to arise and the agreement between measurement and theory is as good as can be expected. (Author)

PB 155 695 $1.60

New Mexico U., Albuquerque.
ATMOSPHERIC OZONE, by Victor H. Regener. Final rept. for Aug 56-May 60 on Contract AF 19(604)1950, 21 Sep 60, 16p. 2 refs. AFCRL-402; AD-254 270.

DESCRIPTORS: *Atmosphere, *Ozone, Determination, Telemetering transmitters, Radiosondes, Balloons, Flight testing.

The work covered the development of a chemical-type telemetering ozone sonde for sounding balloon flights,

as well as the development of an ozone meter for recordings of atmospheric ozone from aircraft. The principle of operation of the wet-chemical aircraft recorder has been described (Advances in Chemistry Series No. 21, pp. 124-127, 1959). The adaptation of this method to the recording of ozone from aircraft is described here. This report also contains an account of test flights made with the balloon sonde and with the aircraft recorder.

PB 155 440 $8.60

Ohio State U. Research Foundation, Columbus, Ohio.
INFRARED ABSORPTION BY CARBON DIOXIDE, by Darrell E. Burch, David Gryvnak, and Dudley Williams. Scientific rept. no. 2 on Contract AF 19(604)2633. Jan 61, 94p. 13 refs. AFCRL-255; AD-253 435.

DESCRIPTORS: *Carbon dioxide, *Gases, *Nitrogen, Infrared radiation, Absorption, Infrared spectroscopy, Measurement, Pressure, *Atmosphere.

The infrared absorption of carbon dioxide was investigated. Samples consisting of carbon dioxide alone, and in binary mixtures with nitrogen, were investigated over wide ranges of absorber concentration w and total pressure P. From the absorption by each band or spectral interval, it was possible to determine either the total absorption or the mean fractional absorption for each sample. Curves are presented which show the total absorption of the CO_2 bands at 1/3716, 1/3609, 1/2350, 1/1064, and 1/961 cm for various values of absorber concentration as a function of equivalent pressure P sub e, which is a parameter that includes the total pressure P and a small additional term proportional to the partial pressure of the absorbing gas. Absorption curves for the 1/1064 and 1/961 cm bands as well as for the 1/875 to 1/495 cm region, were obtained for different samples of CO_2 at temperatures from ambient to approximately 70 C. For the temperature range covered it is possible to predict the increase in total absorption of the 1/1064 and 1/961 cm bands by use of an elementary function which is based on the calculated increase in population of the lower energy level giving rise to the absorption. (Author)

PB 156 103 $7.60

Ohio State U. Research Foundation, Columbus.
INVESTIGATION OF UPPER AIR TURBULENCE BY THE METHOD OF ANALYZING STELLAR SCINTILLATION SHADOW PATTERNS, by Philip E. Barnhart, Goeffrey Keller and Walter E. Mitchell, Jr. Final technical rept. for Oct 56-June 59 on Contract AF 19(604)1954, continuation of Contracts AF 19(604)41 and AF 19(604)1409. 31 July 59, 73p. 13 refs. RF proj. 715; AFCRC-TR-59-291; AD-231 378.

DESCRIPTORS: *Upper atmosphere, *Convection, *Stars, Statistical processes, Turbulence, Telescopes, *Optical analysis, Optical images.

A technique was developed for analyzing stellar scintillation shadow patterns to determine the motion and structure of such patterns and the relations between them and the layer or layers in the atmosphere producing them. Equipment was constructed which materially reduced the difficulty of data reduction in the solution of the problem. The autocorrelation method was utilized to produce information concerning the location in the atmosphere of the turbulent layers responsible for scintillation of starlight, motions in these layers, persistence of the turbulent elements, and the sizes and shapes of the turbulent elements. Equipment developed for the project consists of specially mounted dual telescopes, photoelectric gear for each telescope, and an automatic correlation computer with associated circuitry. Directions and speeds of shadow pattern motion are measured by the dual probe and compared with rawinsonde data for the appropriate nights. A brief study of the pattern persistence is given with particular attention being paid to the distance traveled by the pattern before it decays completely. Measurements of the element sizes are discussed, and spectra of the pattern element sizes are computed as well as the spectra of density of air fluctuation element sizes. (Author)

PB 154 826 $4.60

Scripps Institution of Oceanography, U. of California, La Jolla.
ATMOSPHERIC RADIATION TABLES, by Walter M. Elsasser and Margaret F. Culbertson. Final rept. on Contract AF 19(604)2413. Feb 60, 48p. 43 refs. AFCRL-TR-60-236; AD-251 172.

This report released for sale to the public 13 June 61.

DESCRIPTORS: *Atmosphere, Air, *Transmission, *Infrared radiation, Infrared spectroscopy, Tables, Absorption, Meteorological data, Heat transfer.

Tabular material on the emission and transmission of the far infrared bands of water vapor, carbon dioxide, and ozone are given. The values are based entirely on laboratory measurements made with long optical paths (with the exception only of the water-vapor absorption in the window near 10 micron). All the bands appearing in the spontaneous emission of atmospheric air at common atmospheric temperatures are included. This comprises five bands, the 6.3 micron band and the rotational band of water vapor, the 14 micron band of carbon dioxide and the 9.6 and 11 micron bands of ozone. The ozone bands are found to be of minor importance in atmospheric heat transfer. Of greater importance is the overlap of the 14 micron carbon dioxide band and the rotational water-vapor band. Tables of this overlap are given. (Author)

ENGINEERING

PB 155 451 $1.10

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATIONS OF RARE-EARTH OXIDE CATHODES, by J. B. Baker and G. B. Gaines. Scientific rept. no. 6, 1 Nov 60-31 Jan 61, on Contract AF 19(604)5691. 1 Feb 61, 10p. 1 ref. AFCRL-90; AD-253 505.

DESCRIPTORS: *Thermionic emission, *Rare earths, *Cathodes (Electron tubes), Materials, *Oxide cathodes, Tests, Nitrocellulose.

It was found that the inclusion of a small amount of nitrocellulose in a coating composed of 75 per cent Nd_2O_3 and 25 per cent Gd_2O_3 had no appreciable effect upon the emission, except, perhaps, to cause activation to occur at a lower temperature. A cathode containing 90 per cent Gd_2O_3 and 10 per cent Nd_2O_3 gave an emission level less than 0.1 amp-cm^2 at 1400°C. Initial indications show that the high emission from Gd_2O_3 can be reproduced. The reason for the high activation is not yet known and needs further investigation. (Author) (See also PB 153 823)

PB 171 841 $3.00

General Precision, Inc., New York.
MANAGING A DEVELOPMENT PROGRAM, by George T. Mundorff and William Bloom. 1960, 173p.

DESCRIPTORS: *Research program administration, *Management engineering.

This manual is designed to serve as a reference text for persons interested in developing an analytical and orderly approach to management. The principles and procedures illustrated by this case study have been refined and proven through repeatedly successful applications over the course of a number of years. They will be found highly effective for planning, evaluating and controlling other development programs, no matter how large or complex.

PB 156 337 $5.60

Gibbs and Cox, Inc., New York.
CONSIDERATION OF SIZE-SPEED-POWER IN HYDROFOIL CRAFT, by S. F. Hoerner. Nov 58, 54p. 13 refs. AD-214 011.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Hydrofoil boats, Design, Velocity, Power.

PB 171 822 $1.50

Naval Radiological Defense Lab., San Francisco, Calif.
THE SHELTER OCCUPANCY TEST OF 25-29 JULY 1960, by W. E. Strope, D. P. Schultze, and J. I. Pond. Preliminary rept. 21 Mar 61, 57p. 5 refs. USNRDL-TR-502; AD-253 856.

DESCRIPTORS: *Protective shelters, Tests, Construction, Costs, *Civilian defense systems, Shelters.

The USNRDL experimental shelter at Camp Parks, California, was occupied continually by 100 male volunteers for a period of 100 hours under summer conditions of outside air temperature. During this period, all aspects of the shelter environment were monitored, as well as the actions and responses of the shelterees. Modifications to shelter facilities were tested, the palatability of and preparation procedures for an experimental shelter diet were evaluated, and additional experience in shelter management was obtained. This is a preliminary report made in advance of complete analysis of the data. (Author)

PB 171 840 $2.25

Struthers Wells Corp., Warren, Pa.
A NEW PROCESS FOR THE PRODUCTION OF FRESH WATER FROM SEA WATER, by Hans Svanoe, J. S. Colton (Scientific Design Co., Inc.) and others. Final technical rept. 18 Nov 59-1 Oct 60, on Contract no. 14-01-001-189. June 61, 87p. 11 refs. Saline Water Research and Development Progress rept. no. 47.

DESCRIPTORS: Sea water, *Desalination, Freezing, Ice, Crystallization, Water.

The Struthers Wells - Scientific Design process is a freezing process employing direct contact between saline water and a hydrocarbon refrigerant. It differs from other freezing processes principally in using techniques of controlled crystallization to produce large, uniformly sized and regularly shaped (low ratio of surface to volume) pure ice crystals. Skillful conservation of energy is another feature of the process.

Aeronautical Engineering

PB 156 123 $3.60

Polytechnic Inst. of Brooklyn, N. Y.
GENERAL INSTABILITY OF REINFORCED SHELLS UNDER HYDROSTATIC PRESSURE, by V. L. Salerno and B. Levine. Rept. on Contract N6onr-26303. Sep 51, 34p. 7 refs. PIBAL rept. no. 189; ATI-135 357.

This report released for sale to the public 12 June 61.

DESCRIPTORS: *Hydrostatic pressure, *Structures, Buckling, *Cylindrical bodies, Aircraft, *Structural shells, Theory.

Both simple supports and edges which are clamped against rotation at the bulkhead are considered. For both cases it is assumed that no strain energy is stored in the bulkheads. The expressions for the strain energy stored in the shell and rings as well as the potential of the external load are the same as those developed for the one bay case. However, the limits of the integrations in the axial direction are O and L_b where L_b is now the total distance between bulkheads. In addition, the strain energy stored in each ring frame between bulkheads must be summed in order to find the total energy stored in all the ring frames.

PB 156 112 $3.60

Weapons Guidance Lab., Wright Air Development [Div.] Wright-Patterson Air Force Base, Ohio.
SIMULATION AND EVALUATION OF A PROPOSED ANALYTIC FLIGHT PATH COMPUTER, by Philip Gevas and William L. Harmon. Rept. on Investigation of Program Computer for Precision Navigation. Dec 57, 40p. 4 refs. WADC Technical note 57-420; AD-142 229.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Navigation computers, Errors, *Simulation, Tests, Helical springs, *Flight paths, Determination, Computers.

A proposed analytic flight path computer designed to guide an aircraft to a fixed point and arriving at a given time with a specified ground track is simulated and tested. The resulting flight paths for various initial and final conditions are evaluated. The continuously computed desired-heading angle necessary to satisfy the initial conditions and final boundary conditions is obtained from an analytic solution determined by the Raytheon Manufacturing Company on Air Force contract. This solution, which includes a linear interpolation approximation, is one of several optimum solutions in terms of the resulting flight paths and ease of instrumentation. The analytic solution is successfully approximated with a diode function generator. The solution generates flight paths which successfully solve the guidance problem. The analytic computer is compared to the elastica spring computer designed to solve the same problem. The coefficient of the linear interpolation approximation is found to be critical for large angles of approach. Recommendations are made which point to further investigations of the analytic solution. (Author)

Civil Engineering

PB 156 120 $9.60

Iowa Inst. of Hydraulic Research, Iowa City.
WIND-TUNNEL STUDIES OF PRESSURE DISTRIBUTION ON ELEMENTARY BUILDING FORMS, by Ning Chien, Yin Feng and others. Rept. on Contract N8onr-500. 1951. 117p. 16 refs. ATI-123 506.

This report released for sale to the public 14 June 61.

DESCRIPTORS: Construction, *Structures, Pressure, Distribution, Model tests, *Wind tunnels, *Civil engineering.

PB 154 696 $1.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
THE EFFECTS OF ONE MEGACYCLE ULTRASONIC VIBRATION ON THE COMPRESSIVE STRENGTH OF PORTLAND CEMENT MORTAR, by J. M. Hayhoe. Final rept. 9 Sep 59, 9p. Technical note N-374; AD-250 636L.

DESCRIPTORS: *Cements, Concrete, Ultrasonics, *Ultrasonic radiation, Mechanical properties, *Mortar.

One-half of each of the ultrasonic and standard specimens were tested in compression at 7 days age and the other half were tested at 28 days age. At 7 days age, the ultrasonically prepared specimens exhibited approximately 1380 psi (24 percent) less compressive strength than those prepared by standard ASTM procedures. At 28 days age, the compressive strength relationship of the ultrasonic and standard specimens was the same but the compressive strength loss increased to 2180 psi (28 percent). This limited investigation indicates that the application of 1 megacycle ultrasonic vibration to portland cement-water paste reduces the ultimate compressive strength of mortars made with this paste and that a very powerful ultrasonic generator, not presently available, would be required to agitate construction quantities of mortar and/or concrete. (Author)

Electrical and Electronic Engineering

PB 155 477 $10.50

Air Force Cambridge Research Labs., Bedford, Mass.
RADIO DISTANCE MEASUREMENT AND POSITION FIXING; A SURVEY AND EVALUATION OF TECHNIQUES AND SYSTEMS, by Martin Katzin. Final rept. Sep 60, 136p. 95 refs. AFCRC-TR-60-191; AD-253 111.

DESCRIPTORS: Radio, Radio astronomy, *Radio navigation, Radio transmission, Radio waves, *Direction finding, Propagation, *Position finding, Radio altimeters, Atmosphere, Ionospheric propagation, *Range finding.

This paper gives a survey and discussion of radio methods of distance measurement and position fixing, a general discussion of the important propagation characteristics and accuracy of radio wave methods, followed by a classification of systems and the advantages and disadvantages of radio methods. Also included is a description of various specific systems in use or under development, the types of application to which each is adapted, the range and accuracy already achieved and the limitations imposed by various factors, especially inherent propagation characteristics. (Author)

PB 156 331 $1.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A TIME GATE FOR ECHO-MEASURING RADAR INSTALLATIONS, by J. Bacon and J. Burgess. Rept. on Techniques for Echo Area Determination, Contract AF 33(616)5398. 15 Jan 59, 16p. 4 refs. Rept. 792-4; AD-212 351.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Triggered gates, Design, *Radar echo areas; Determination, Recording systems, Transducers.

PB 154 935 $8.60

Chalmers U. of Tech. (Sweden).
RESEARCH NOTES COMMUNICATED AT THE RADIO SCIENTIFIC CONFERENCE IN STOCKHOLM, FEBRUARY 29 - MARCH 2, 1960. Rept. no. 13 on Contract AF 61(052)159. 1960, 99p. 35 refs. Research rept. no. 6, 1960; AFCRL-TN-60-1137; AD-251 560.

DESCRIPTORS: *Microwave amplifiers, Theory, *Traveling wave tubes, *Radio astronomy, *Galaxies, *Solar noise, *Space charges, *Electromagnetic waves, *Electron tubes, *Waveguides, *Conferences, Electron beams, Electrons, Magnetic fields, Helixes, Frequency shift, Mathematical analysis.

Contents: Experimental investigation of amplification at 960 mc; Design considerations for a traveling wave maser at X-band; Experiments with a 3-level solid-state maser on 460 mc; On the doppler effect in dispersive, inhomogeneous media; Observations of radio star scintillations at high latitudes; Measurement of

21 cm hydrogen line radiation from the galaxy; The application of masers and mavars to radio astronomy: Observations of solar radio noise on 150 mc; An experimental investigation of the dc and ac properties of electron beams; Space charge waves and electron velocity distribution in an electron beam; Space charge waves on an electron beam with gaussian density distribution; On the coupling between waves in inhomogeneous systems; On the interaction between space charge waves and electromagnetic waves in a cold plasma; Low frequency waves in magneto ionic media in the presence of a string magnetic field; Frequency shift by means of rotation tube; The interaction between electromagnetic waves and electron beam in a waveguide device; On the field theory of the sheath helix TWT.

PB 150 166 $4.60

Columbia Radiation Lab., New York
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM, by P. Kusch. Quarterly progress rept. no. 2, 16 Mar-15 June 60, on Contract DA 36-039-sc-78330, and rept. also on Contracts Nonr-266(45), AF 49(638)(507, 557, and 631). 15 June 60, 47p. 23 refs. CU-6-60-sc-78330; AD-241 684.

DESCRIPTORS: *Magnetrons, *Microwave spectroscopy, Cerenkov radiation, Microwave equipment, *Molecular beams, Hyperfine structure, Atoms, Gases, Microwave amplifiers, Microwave networks.

Studies are concerned with the investigation of those basic physical properties of matter of interest in the design of masers; with the design of masers to meet a variety of needs; and with the application of masers to the study of various physical and astronomic problems Work in each of these aspects of maser research is described. The design of a radio-telescope to be utilized in a measurement of the oxygen content of the upper atmosphere and not using a maser amplifier is discussed. Various problems in the determination of atomic hyperfine structures are under investigation. The present emphasis lies in atomic states other than the gound state and in reasonably short lived radioactive isotopes. Studies in various problems of chemical physics, principally related to the properties of the gases evaporated from substances that are ordinarily solids are described. (Author) (See also PB 147 633)

PB 154 247 $1.60

David Sarnoff Research Center, Princeton, N. J.
UNIPOLAR CONTROL DEVICES, by J. T. Wallmark, Final rept. 15 Apr 59-15 Oct 60, on Contract AF 19(604)5561. 31 Oct 60, 12p. 8 refs. AFCRL-TR-60-361; AD-249 673.

DESCRIPTORS: *Transistors, *Computers, *Electronic circuits, Semiconductors, Circuits, Mathematical logic.

Work was previously done in the field of integrated circuits or devices. Experience with fabrication of particular integrated circuits led to important conclusions about multi-element structures in general and therefore applicable not only to semiconductor devices but also to cryogenic, magnetic, field emission, etc. devices. These design considerations were then used to guide the selection of a suitable approach to integrated electronics. The system of direct-coupled unipolar transistor logic was chosen as most in line with these considerations. It was found that all the logic circuits in a computer could be constructed in integrated form using this system. A typical example illustrating the principle and at the same time providing a very attractive practical application is an integrated binary adder. (Author)

PB 156 089 $5.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
ELECTRONIC HEATING AND BREAKDOWN OF SEMICONDUCTORS IN MICROWAVE FIELDS: AN INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by Karl H. Seeger. Technical rept. no. 1, 1 Mar 57-18 May 58, on Contracts DA 36-039-sc-73150 and AF 49(638)417. 1 Oct 58, 52p. 40 refs. AFOSR-TN-59-57; AD-209 428.

DESCRIPTORS: *Radar duplexers, *Electronic switches, *Semiconductors, *Induction heating, Ionization, Conductivity, Plasma physics.

A research program has been carried out to investigate the use of semiconductors for a TR microwave switch. A semiconductor switch using germanium at liquid helium temperature has been found superior to gasfilled TR tubes with respect to nondestructive breakdown. Because of the inconvenience of the low temperature, investigations have been made with germanium with deep levels at liquid nitrogen temperature. In addition, with ordinary germanium of various impurity concentrations the electron energy transfer mechanism including optical and acoustical phonon scattering has been studied at both high and low microwave power levels between $80^{o}K$ and $300^{o}K$. Electron-electron scattering seems to dominate the energy transfer to the lattice, since the high-field mobility apparently depends on the carrier concentration. The experimental data are in agreement with those obtained by DC methods. This suggests that the relaxation time of the carriers is smaller than 5×10^{-12} sec. (Author)

PB 155 629 $5.60

Electronics Research Lab., U. of California, Berkeley.
MINIMAL-TIME DISCRETE SYSTEM, by C. A. Desoer and J. Wing. Scientific rept. no. 4 on Contract AF 19(604)5466 and rept. on Contract AF 18(600)1521. 15 Nov 60, 51p. 16 refs. IER series no. 60, issue no. 327; AFCRL-111; AFOSR-30; AD-254 012.

DESCRIPTORS: *Control systems, Servomechanisms, Analog computers, Mathematical analysis, Computers.

This paper considers the following sampled-data control system: the forward path consists of a sampler with period T, a zero-order hold circuit, a linear am-

plifier and a plant with transfer function $G(s) = 1/\prod_{i=1}^{n}(s-\lambda_i)$. The poles of G(s) must be real distinct and non-positive. Thus a single integrator is permissible. The control signal f(t) applied to the sampler is restricted by $|f(t)| \leq 1$. The problem is: given an arbitrary set of initial conditions find the forcing function f(t), satisfying $|f(t)| \leq 1$, and the corresponding computer to be placed in the feedback loop which will bring the system to equilibrium in the minimum number of sampling periods.

PB 154 233 $10.10

Electronic Communications, Inc., Timonium, Md.
QUASI-OPTICAL COMPONENTS AND SURFACE WAVEGUIDES FOR THE 100 TO 300 KMC FREQUENCY RANGE, by M. J. King, J. D. Rodgers and others. Scientific rept. no. 2 on Contract AF 19(604)5475. Nov 60, 122p. 30 refs. AFCRL-TN-60-1157; AD-249 822.

DESCRIPTORS: *Waveguides, *Transmission lines, Microwave equipment, Dielectric properties, Interferometers, Phase shifters, Crystal mixers, Crystal detectors.

Components and techniques for the generation, transmission, and detection of energy in the 100 to 300 kmc frequency region were investigated theoretically and experimentally. The design and construction of fundamental components, such as harmonic generators and detectors, were necessary. Design data are given for these components. A detailed theoretical analysis was performed for the propagation characteristics of single-conductor transmission lines, and attenuation calculations were made for several dielectric image lines. Experimental measurements were made at 105 and 140 kmc on these two types of surface waveguides. Attenuation of these lines is compared with that of dominant-mode rectangular wave-guide. The practicability of using TE sub zero one-mode circular waveguide is discussed. An analysis of phase-correcting Fresnel zone plates was carried out, and several zone plates were designed, constructed and successfully tested at frequencies of 140 and 210 kmc. The zone plates were used at these frequencies to make relatively long path transmission measurements and were also used in a specially designed Michelson interferometer. The dielectric properties of a number of plastic materials were determined by measurements made with the interferometer. (Author)

PB 155 176 $1.60

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
SANDWICH-WIRE ANTENNA, by Kun-mu Chen. Scientific rept. no. 9 (Series 2) on Contract AF 19(604)4118. 15 Sep 60, 18p. 4 refs. AFCRL-31; AD-252 480.

DESCRIPTORS: *Antennas, Design, Configuration, Theory, Attenuation, Mathematical analysis, Microwaves.

An approximate theoretical study of a sandwich-wire antenna is presented. The two outer conductors are in parallel and the center conductor is bent into triangular form with a period equal to the wavelength. The attenuation constant is obtained. The radiation pattern of an array consisting of a number of sandwich-wire antenna is evaluated. The theoretical results are compared with the existing experimental data. (Author)

PB 155 102 $4.60

Hughes Research Labs., Malibu, Calif.
AIRBORNE MASER FEASIBILITY STUDY, by Owen G. Owens and Henry R. Senf. Final rept. on Contract AF 19(604)7382. Jan 61, 48p. 9 refs. AFCRL-50; AD-251 891.

DESCRIPTORS: *Microwave amplifiers, Ruby, *Preamplifiers, *Electronic circuits, X-band, *Radiofrequency amplifiers, Radio receivers, *Communication equipment, Circuits, Microwave oscillators, Amplifiers, Airborne.

The results are described of a feasibility study of low-noise preamplifiers for an airborne X-band receiver. Several classes of masers and parametric amplifiers were considered. Estimates of the overall system noise temperature, pump frequency, and pump power associated with the use of each type of amplifier are given. The recommended receiver front-end consists of a traveling-wave maser cooled by a closed-cycle helium refrigerator, a conventional mixer and IF preamplifier, and a crystal-controlled solid-state local oscillator. Tentative values for the outline dimensions, weights, input power requirements, and other physical characteristics needed to accomplish a coordinated plan for the design of the complete airborne communication terminal are presented. Isometric drawings showing a recommended physical arrangement of the components of the receiver front-end mounted on the antenna structure within the radome are provided. (Author)

UCRL-6276 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
MINIMUM RISE TIMES OF CURRENT IN IGNITRONS, by D. B. Cummings. Rept. on Contract W-7405-eng-48. 10 Jan 61, 25p.

PB 154 586 $2.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE STUDY OF WAVEGUIDE SHORTING PLUNGERS, by Robert N. Assaly. Rept. on Contract AF 19(604)7400. 25 Jan 61, 25p. 315G-0001; AD-251 041.

DESCRIPTORS: *Waveguides, *Waveguide plungers, Analysis.

The theoretical study and experimental measurements of various sliding short circuits are studied with the view that designs of low loss are most desirable. The most common short design is the plane metal disc with fingers along its edge that makes sliding contact with the waveguide walls. However, if one of the fingers does not make good contact, a voltage will develop across it and this may initiate undesirable electric arcing. Logically, a better design might be a metal piece, or slug,

that does not make contact, or even come close, to the waveguide walls. Some of the energy will propagate along the waveguide section containing the slug, and a fraction of this energy travels again into the waveguide beyond. A theory is given which shows that the piece has a length where the transmitted energy is a minimum. For this length, most of the energy is reflected at the front surface of the slug, and the difficulties of high power should be reduced. (Author)

PB 171 850 $1.25

Lockheed Aircraft Corp., Sunnyvale, Calif.
PHOTOVOLTAIC CELLS, by Maureen Pearcy. 11 Aug 60, 45p. 136 refs. Special bibliography SB-60-28; AD-248 065.

DESCRIPTORS: *Photoelectric cells, *Photoelectric effect, Photoelectric effect (Gamma rays), *Bibliography.

PB 155 103 $4.60

Microwave Lab., Stanford U., Calif.
GENERAL STUDIES IN HIGH-POWER MICROWAVE CONCEPTS, by M. Chodorow. Scientific rept. no. 26, 1 July-30 Sep 60, on Contract AF 19(604)1930. Nov 60, 47p. 12 refs. M. L. rept. no. 771; AFCRL-TN-60-1165; AD-252 362.

DESCRIPTORS: *Microwave equipment, Ferrites, *Plasma physics, Electromagnetic waves, Microwaves, Propagation, Electron beams, *Electron tubes, Electron guns, *Microwave amplifiers, Frequency multipliers.

Progress is reported for three major areas of microwave research: (1) microwave tube studies, (2) plasma physics studies, and (3) ferrite studies.

PB 156 299 $4.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
DEVELOPMENT OF A HIGH-POWER ANTENNA-DUMMY LOAD WAVEGUIDE SWITCH, by Richard LaRosa and Harold Rapaport. Final rept. on Contract AF 30(602)387. 8 May 53, declassified 4 Sep 53. 43p. 2 refs. Rept. R-322-53; PIB-258; AD-50 359.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Waveguide switches, Design, *Dummy loads, *Radar antennas, Circuits, Antennas, Switches.

A high power antenna-dummy load switch is described for use in the 1220-1361 Mc frequency region. Data for the VSWR, insertion loss, and power handling capabilities are given. An approximate theory of operation is presented which should be applicable in the design of similar switches for use in other frequency regions. (Author)

PB 155 206 $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
LEAKY WAVE CONTRIBUTIONS TO THE FIELD OF AN ELECTRIC LINE SOURCE ABOVE A PLASMA SLAB, by T. Tamir. Rept. on Contract AF 19(604)2031. 9 Nov 60, 33p. 2 refs. Research rept. PIBMRI-845-60; AFCRL-TN-60-1158; AD-252 728

DESCRIPTORS: *Plasma physics, Transmission lines, *Electromagnetic waves, Electromagnetic wave reflections, *Electromagnetic fields.

As a further continuation of the investigations of leaky waves in dielectric slabs, the problem of a plasma slab, excited by a current line source, is analyzed. Since no surface waves are present in this case, the strength of the leaky waves is compared to the space field. The space wave field is evaluated and conditions for the existence of leaky waves are formulated; the location of leaky wave poles is then determined and their contribution to the field is evaluated. For most cases, this contribution is not appreciable and, to first order of magnitude, the total field is given only by the space wave. However, for very thick slabs and for frequencies higher than the plasma frequency, the leaky waves may become predominant in certain specific directions and for some ranges in the vicinity of the source; on the other hand, the importance of such leaky waves seems to be restricted, due to the existence of a large number of contributing poles. (Author)

PB 155 481 $4.60

Montana State Coll., Bozeman.
ITERATIVE SWITCHING NETWORKS COMPOSED OF COMBINATIONAL CELLS, by William Kilmer. Scientific rept. no. 1 on Contract AF 19(604)6619. 1 Dec 60, 45p. 36 refs. AFCRL-TN-60-1108; AD-253 612.

DESCRIPTORS: *Switching circuits, Design, *Electrical networks, Theory, Sequence switches, Synthesis, Reliability, Digital computers, Transients, Scheduling, Computers.

An n-dimensional iterative switching network consists of a number of identical logic cells uniformly interconnected through discrete information channels along each of n axis directions in space. This paper antecedes a general treatment of such networks by focusing on the 1-dimensional case, or the case of a linear cellular array, where cells are combinational, the information channels between them are bilateral, and switching is done synchronously with unit delay through each cell. These constraints are justified by demonstrating the behavioral equivalences which exist between corresponding combinational-cell and sequential-cell networks. Three classes of networks are formed according to whether or not information flowing in one direction along the cellular array is dependent upon that flowing in the other direction. A synoptic discussion of Hennie's steady-state analysis results is given for the three classes, and the relative merit and character of the class having mutually dependent information flow is discussed. The main part of the paper deals with this class as the only one which can exhibit stable-state memory properties, and proves several important

theorems concerning these properties. A transposition of some of Hennie's previous results is given as a start on the transients and cycling problems. (Author)

PB 154 344 $5.60

New York U. Coll. of Engineering, N. Y.
AN OPTIMIZATION PROCEDURE FOR A SINGLE-LINK UNIDIRECTIONAL COMMUNICATION SYSTEM IN THE PRESENCE OF ADDITIVE GAUSSIAN AND IMPULSIVE NOISE AND FOR DETECTION INDEPENDENT OF FADING, by Ludwik Kurz. Scientific rept. no. 4 on Contract AF 19(604)6168. 30 Sep 60, 55p. 6 refs. AFCRL-TN-60-1116; AD-250 211.

DESCRIPTORS: Digital systems, *Communication systems, *Communications theory, Coding, Signal to noise ratio, Errors, Signals, Detection, *Detectors, Circuits, Noise.

The basic problem is considered of transmitting digital information through a noisy channel with minimum probability of error in finite time. The transmitted signals are average-power limited, and the noise is assumed to be additive Gaussian and impulsive. The Gaussian noise is specified by its power spectrum and the impulsive noise by the statistics of its amplitudes (large variance, zero mean) and probability of occurrence in time (Poisson's distribution). Both components of noise are assumed to be statistically independent. The theory of efficient equidistant, and nearly equidistant codes is extended to the case of Gaussian and impulsive noise. It is shown that a considerable improvement in the reliability of the system can be achieved by slowing down the rate of transmission of information. For the white Gaussian noise spectrum the performance of a system using the repeated equidistant code is optimum from the point of view of reliability and simplicity of the resulting detector. Performance results are given for different codes for white Gaussian noise and Gaussian noise with power spectrum that increases with frequency. A circuit for a simple detector to be used with equidistant and repeated equidistant codes is suggested. (Author)

PB 156 108 $10.10

Ohio State U. Research Foundation, Columbus.
ANALYTICAL STUDY ON THE TRANSVERSE FIELD TRAVELING-WAVE TUBES, by Fang-Shang Chen. Technical note no. 5 on Contract AF 18(600)982. July 59, 122p. 55 refs. RF-579; AFOSR-TN-59-985; AD-228 321.

DESCRIPTORS: *Traveling wave tubes, Electron beams, Focusing, *Electric fields, Plasma oscillations, Broadband, Microwave amplifiers, Preamplifiers.

It is known that transverse-field traveling-wave tubes have a low noise figure when the beam is well collimated. The present analysis shows in detail the properties of the slow-wave structure, the electronic motion, and the mechanism of energy exchange between the electron beam and the traveling wave from which gain, noise figure, and frequency response are evaluated. The proposed tube has a slow-wave structure composed of two flat helices, each of them wound on a conducting metal plate but insulated from it. By properly exciting the two helices, one obtains a transverse field between them. Direct potential is applied between the helices and the metal plates for periodic electrostatic focusing of the electron beam. The analysis of the slow-wave structure shows that two fundamental slow-wave modes can be excited. The propagation constants and the interaction impedances of these two modes are calculated. Also the field configuration in the various regions of the slow-wave structure is shown. (Author)

PB 154 265 $2.60

Ohio State U. Research Foundation, Columbus.
HIGH FREQUENCY OSCILLATION PHENOMENA, by E. M. Boone, R. M. Campbell and others. Final rept. on Contract AF 49(638)707. Dec 60, 26p. Rept. 972-Final; AFOSR-72; AD-249 934.

DESCRIPTORS: Traveling wave tubes, Amplifiers, Oscillators, *Microwave amplifiers, *Microwave oscillators, *Electron tube oscillators, X band, *Microwaves, Propagation, Theory, Space charges, *Phase shifters, *Magnetrons, *Radial beam tubes.

A radial-beam retarding-field oscillator in which the cathode surrounds the RF structure was designed and constructed as a first prototype of an oscillator that might be scaled for operation at millimeter wavelengths without excessive cathode loading. The prototype radial beam tube produced 5 w at a beam voltage of 1800 v, cathode current 0.64 amp at a frequency of of 10 kmc. A second major portion of this effort involves the propagation characteristics of a dense electron plasma at microwave frequencies. A magnetron without a resonant circuit can be utilized as a phase shifter in a waveguide circuit. In the device tested, the axis of the rotating electron cloud was perpendicular to the direction of propagation of the electromagnetic wave and perpendicular to the E field in the waveguide. By using the magnetron as one arm of a comparison bridge circuit, an effective permittivity in the region of the rotating electron cloud was measured. By varying the magnetic field, it was possible to vary the relative permittivity from -4 to +4. In the case of the negative permittivity, this resulted in a 1db attenuation of the propagating wave, and for the positive permittivity, a phase shift of 2 degrees resulted. These results indicate the possibility of developing a phase shifter with this type of device if a longer interaction region can be utilized. (Author)

PB 154 470 $2.60

Philco Corp. [Philadelphia, Pa.]
LOW-LEVEL SWITCHING TRANSISTOR DEVELOPMENT, by A. D. Rittmann. Quarterly progress rept. no. 3, 15 Jan-15 Apr 55 on Contract DA 36-039-sc-64429. [1955] 25p. AD-71 213.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Transistors, *Switching circuits, *Design, Materials, Tests.

Al Si-alloy transistors: Alloying of Al is achieved without the use of the Aquadag cocoon if certain precautions, such as the degree of vacuum, and the cleanliness of the Si blank and the evaporation heater coils, are observed during evaporation. Ten soldered and encapsulated transistors were stored at 145°C. After 192 hr, the averages of $\alpha/(1 - \alpha)$, r_c, and V_{max} had increased between 10 and 15%; the average of I_{CO} had increased from 0.0005 μa to 0.002 μa. Four soldered and encapsulated transistors underwent 500-g shock test in 3 planes, 10-g vibration test in 3 planes from 10 to 2000 c, and 10,000-g centrifuge test in 3 planes, without mechanical failure. An effort was started to replace the evaporation of Al through masks by electrochemical jet plating of Al (J. Electrochem. Soc. 99:232-244, 1959). Si surface-barrier transistors: When the concentrations of tin chloride and $PbCl_2$ (the secondary constituents in the Zn-plating solution) were optimized, the room temperature life storage was improved; the transistors still deteriorated with storage above 90°C. Deterioration is probably due to the conversion of the surface of the Si at the periphery of the electrodes to low-resistivity p-type. Attempts to maintain an n-type surface by covering the surface with nonconducting metal films were unsuccessful.

PB 154 519 $11.00

Polytechnic Research and Development Co., Inc., Brooklyn, N. Y.
WAVEGUIDE COMPONENTS FOR MILLIMETER SYSTEMS, by Samuel W. Rubin. Final rept. for 15 June 54-15 Oct 58 on Contract DA 36-039-sc-63100. 15 Oct 58, declassified 30 Aug 60, 149p. 47 refs.

DESCRIPTORS: *Waveguides, *Microwave equipment, Waveguide bends, Waveguide couplers, Waveguide joints, Design.

A study was made of the applicability of existing design art in the millimeter and microwave spectrum to components for RG-98/U rectangular waveguide systems. A series of eleven passive components were then developed for use particularly in the 4.3 millimeter band in RG-98/U. (Author)

PB 154 390 $1.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON PARAMAGNETIC RESONANCES, by R. L. Kyhl and M. W. P. Strandberg. Quarterly progress rept. no. 3, 15 Jan-15 Apr 58, on Contract DA 36-039-sc-74895. [1958] 14p. 5 refs.

DESCRIPTORS: *Paramagnetic resonance, Paramagnetic crystals, Amplifiers, Crystals, *Microwave amplifiers, Ruby.

Gain and oscillation were obtained from a paramagnetic crystal at 9 kmc by 180° - pulse inversion. Two energy levels and a single transition frequency in the spectrum of chromium in potassium cobalticyanide were used. The inversion pulses were of 10-μsec duration. The oscillations showed an anomalous time dependence. A three-level maser was excited with ~1μsec pumping pulses. The resulting oscillations showed a double decay, with the longer time constant approaching 1 msec. (Author)

PB 154 977 $4.60

Space Electronics Corp., Glendale, Calif.
AN ELECTRONIC SELF-FOCUSING TRACKING ANTENNA SYSTEM. Final rept. on Contract AF 19(604)7238. 30 Nov 60, 45p. 12 refs. Rept. no. SEC 30R-1; AFCRL-TR-60-370; AD-251 938.

This report released for sale to the public 13 June 61.

DESCRIPTORS: *Antennas, Radio signals, Detection. Phase detectors, Focusing, Signal to noise ratio, Tracking, Tests, Antenna simulators, Mathematical analysis, Automatic.

An automatic, electronic, self-focusing antenna array, is described. This system consists of a number of elemental antennas whose signal phase differences are adaptively adjusted by the use of phase-lock loops. The signals on each elemental antenna are thus added coherently irrespective of the direction of arrival of the incoming wave or irrespective of phase perturbations at the elemental antennas. The noise in each of the elemental circuits is added incoherently. The intent of this program is the development of an adaptive antenna system. A theoretical analysis was made and tests were performed with eight simulated elemental antennas. The operation of the system appears to be essentially independent of the number of elemental antennas. It was demonstrated that the system acquires the signal in the shortest possible time for any signal and noise conditions. It should be noted that the acquisition time of a conventional directive antenna system is fixed for all signal levels greater than the minimum detectable signal for which the system was designed. A conventional antenna system will not acquire signals below the design level. The phase-lock system, being adaptive, has short acquisition times for large signals and will acquire weak signals which the conventional search system will miss. (Author)

PB 156 343 $5.60

Space Technology Labs., Inc., Los Angeles, Calif.
DESIGN TECHNIQUES FOR REGULATED STATIC CONVERTERS, by William A. Manahan. Jan 60, 53p. 55 refs. STL/TN-59-0000-00851; [AFBMD] Doc. no. A60-7272.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Frequency converters, *Guided missiles, *Aircraft, Airborne, *Voltage regulators, Design, Electrical equipment, Inverter circuits.

The report summarizes developments of static converters to exploit available components in terms of reliability, efficiency, size, weight, and power. The report defines converters as devices which invert (modulate), a-c transform, and rectify (demodulate) the input d-c. Efficient and reliable circuits utilizing push-pull, magnetically coupled, transistor multivibrators are analyzed. D-C line voltage regulators which can be efficiently mechanized by using switching techniques without sacrifice of transistor voltage rating are shown. D-C voltage regulators are also described which add a controlled voltage to the line voltage such that average d-c voltage is constant. Switched regulators with pulse width modulation control provide efficient regulation but require filters, and their design is discussed. The

relationship between the reliability problem associated with thermal runaway and the temperature at which the power transistors become thermally divergent is shown. The report also presents a typical state-of-the-art device and a bibliography of applicable literature. (Author)

PB 156 342 $8.10

Space Technology Labs., Inc., Los Angeles, Calif.
DESIGN TECHNIQUES FOR STATIC INVERTERS, by Albert A. Sorensen. July 59, 84p. 39 refs. TR-59-0000-00675; AD-227 785.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Inverted rectifiers, Design, Electrical equipment, Airborne, Semiconductors, *Aircraft, Inverter circuits, *Guided missiles.

A summary is presented of the current state-of-the-art of static inverters utilizing semiconductors as power handling components. Design criteria were evaluated in terms of aircraft or missile electrical power systems. Various methods are discussed for the generation of variable dwell-time, stepped wave used in pulse-duration modulation. The advantages and disadvantages are discussed of inverters which utilize either bridge or parallel inverter power stages. Switching patterns were analyzed to optimize the efficiency of the power transistor in a switching mode. An advanced design static inverter which utilizes the state-of-the-art knowledge is presented.

PB 156 335 $1.10

Stanford Electronics Labs., Stanford U., Calif.
ALUMINO-SILICATE GLASS-TO-MOLYBDENUM-DISC SEAL, by James F. Margiotta. Rept. on Contract Nonr-225(24). 1 Sep 59, 7p. SEL Electron-Devices Techniques Bulletin no. 102; AD-225 955.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Glass seals, *Metal seals, *Traveling wave tubes, *Containers, Design, Aluminum compounds, *Silicates, Disks, Molybdenum.

A description is presented of the preparation of a Mo-glass seal for a TWT envelope. Corning no. 1720 glass tubing was cut to size with a conventional water-cooled cut-off wheel; the ends were hand-ground on a glass plate, immersed in 49% CP HF for 5 sec, and rinsed successively in tap H_2O, distilled H_2O, acetone, distilled H_2O, and EtOH. The Mo disks were given a high polish with extra-fine rubberized abrasive, degreased and rinsed, and fired at 900°C in wet H for 15 min. The surface to be sealed was deplated in a weak H_2CrO_4-H_2SO_4 solution and the part was rinsed in the same manner as was the glass tube. The Mo piece was oxidized by heating with an RF concentrator in air for 3 min at 550°C to form a yellowish-white MoO_3 coating, then heated in a bell jar with a He atmosphere at increasing temperatures up to 1000°C until the MoO_3 disappeared. The glass was jigged into place, the bell jar was refilled with He, and the temperature was raised to 1000°C (brightness) where the glass began to soften. The temperature was increased to 1200°C and held there for 2 or 3 min until the Mo disk dropped into place and the seal was completed. The assembly was allowed to cool, then placed in an annealing oven idling at 450°C with either at 75% N-25% H or a N atmosphere. The atmosphere was switched to line H; the temperature was raised to the annealing point of the glass (715°C), held for 15 min, then allowed to drop to room temperature in 1 1/2 hr.

PB 155 704 $9.10

Stanford Research Inst., Menlo Park, Calif.
METHODS OF SCANNING THE BEAM OF LARGE ANTENNAS, by L. Robinson, M. Andreasen and others. Scientific rept. no. 13, 1 June-31 Aug 60, on Contract AF 19(604)2240. Jan 61, 101p. 18 refs. SRI Proj. no. 2184; AFCRL-92; AD-254 194.

DESCRIPTORS: *Radar reflectors, *Interferometers, *Waveguides, Waveguide slots, Microwave amplifiers, Radio astronomy, *Search radar, *Radar scanning, Radar equipment, *Radar tracking, Design, Electronic equipment, Illumination, Reduction, Radar antennas, Radio beams, Antennas, Reflectors.

Design information is presented on a phase-corrected line-source feed for large spherical reflectors. The feed is of the leaky-wave type, in which radiation can be very accurately controlled along the length of the feed, and it consists of a circular waveguide section perforated by many narrow, transverse slots. A high-resolution radio-astronomy antenna is discussed. This antenna was studied theoretically on the basis of varying the illumination and spacing of the interferometer elements to achieve side-lobe reduction. It was found that side-lobes can, indeed, be lowered, but that the minimum side-lobe level is dependent upon the number of interferometer elements employed and, also, side-lobe reduction is achieved only at some expense in increased beamwidth. A four-frequency up-converter parametric amplifier, which can be combined with a down converter, is also discussed. It may be used to advantage in obtaining electronic scanning as well as a low-noise preamplifier at each element of an array. (Author) (See also PB 153 203)

PB 154 934 $2.60

Technical U., Copenhagen (Denmark).
A SURVEY OF THE THEORY OF WIRE GRIDS, by Tove Larsen. Technical note no. 2 on Contract AF 61(052)319. June 60, 29p. 74 refs. AFCRL-TN-60-1163; AD-251 599.

DESCRIPTORS: Electromagnetic waves, Propagation, Polarization, *Waveguides, *Transmission lines, *Diffraction grating, Electric wire, Theory, Wire, Design, Electromagnetic fields, Diffraction.

The report gives a review of the pertinent literature regarding investigations of the field around a plane wire grid with emphasize on the radiotechnical properties in preference to the optical properties. The review aims at giving a background for the application of the theory of grids for ground wire system design. (Author)

PB 171 839 $3.50

Union Thermoelectric [Corp., Forest Park] Ill.
QUARTZ RESONATOR HANDBOOK. MANUFACTURING GUIDE FOR "AT" TYPE UNITS, ed. by Roger E. Bennett. Rept. on Contract DA 36-039-sc-71061. 1960, 247p. 32 refs. AD-251 289.

DESCRIPTORS: *Quartz resonators, *Handbooks, Piezoelectric materials, Quartz, Crystals, Design, Electrical properties, Temperature, Frequency, Electrodes, *Quartz crystals, Manufacturing methods.

Contents: The piezoelectric effect; Quartz; The crystallography of quartz; Electrical characteristics of a quartz resonator; Modes of motion; The diameter of the resonator plate. Mounts; Cements for bonding; Thickness-frequency coefficient; Shape and contour; Temperature coefficient of frequency; Surface finish; Electrodes; and Atmosphere.

PB 154 317 $5.60

Washington U., Seattle. Coll. of Engineering.
CLOSED FORM ANALYSIS FOR THE RADIATION PATTERN OF THE MODULATED ANTENNA, by Gary Dale Bernard and Akira Ishimaru. Technical rept. no. 40 on Contract AF 19(604)4098. Nov 60, 53p. 12 refs. AFCRL-TN-60-1143; AD-251 531.

DESCRIPTORS: *Antennas, Pulse modulation, *Antenna radiation patterns, Lobing, Mathematical analysis, Amplitude modulation.

A new method of analysis for the far zone radiation pattern of the antenna with modulated aperture field is developed. The type of modulation considered is cosinusoidal amplitude across the aperture, and sinusoidal phase modulation across the aperture. The case of constant amplitude is discussed in detail, and is applied to the modulated slow wave structure. The endfire pattern is considered in detail in terms of fundamental slow wave speed, and the magnitude, sign, and frequency of the phase modulation. It is shown that lower sidelobes and higher gain result if the antenna is excited with the slowest phase velocity, and that the magnitude of the phase modulation must be less than unity. Also, a condition on the magnitude of the phase modulation for minimum first sidelobe is developed. The sidelobe level, beamwidth, gain, and supergain ratio are tabulated vs. the frequency of phase modulation for values of the magnitude of modulation. Also, the relationship between the aperture size and the slow wave velocity and various parameters are clearly presented. A method of realizing a tilted beam with brief example is given. (Author)

PB 156 298 $1.60

Watkins-Johnson Co., Palo Alto, Calif.
BEAM-TYPE PARAMETRIC AMPLIFIER, by Grant E. St. John. Quarterly rept. no. 3, 1 Sep-31 Nov 59, on Contract AF 30(602)1994. 4 Jan 60, 19p. RADC-TN-59-418; AD-232 672.

This report released for sale to the public 8 June 61.

DESCRIPTORS: *Microwave amplifiers, Broadband, *Coupling circuits, Helixes, *Amplifiers, Electron beams, Design, Cyclotrons, L-band, Theory, Operation.

Coupling tester results using a hollow electron beam inside a single helix are reported as covering the frequency range 600-1200 mcs. Analysis of these results verifies conclusively that the interaction observed is with the desired fast cyclotron wave on the beam. Energy transfers to the beam of approximately 16-20 db are reported. A pump structure is proposed for use with the hollow electron beam. The structure consists of an octifilar helix in π-mode transmission and synchronous with the fast cyclotron wave on the beam. The basic theory of operation of this circuit is discussed and some novel advantages it offers are pointed out. Plans for the next quarter include the fabrication of a complete amplifier and additional coupler tests including preliminary noise evaluation. (Author)

PB 155 283 $1.10

Westinghouse Research Labs., Pittsburgh, Pa.
RECTANGULAR OPTICAL-MICROWAVE CAVITY, by B. R. McAvoy. Scientific rept. 7 on Contract AF 19(604)5589. Nov 60, 8p. Research rept. 908C901-R-1; AFCRL-53; AD-252 736.

DESCRIPTORS: Microwave equipment, *Cavity resonators, Design, Waveguides, *Couplings, Paramagnetic resonance, Resonance.

The design of a high Q optical-microwave cavity resonant at 9300 Mc is presented. The use of 80 per cent transparent optical apertures in a rectangular cavity is described. A variable coupling mechanism used at liquid helium temperatures with the cavity is also mentioned. (Author)

Ordnance, Missiles, and Satellite Vehicles

PB 156 306 $8.10

Air Force Ballistic Missile Div., Air Research and Development Command, Inglewood, Calif.
HUMAN ENGINEERING DESIGN STANDARDS FOR MISSILE SYSTEM EQUIPMENT. 1 Nov 58, 86p. 20 refs. AFBMD Exhibit 57-8A; Supersedes WDT Exhibit 57-8 of 1 Aug 57, rev. 1 Mar 58.

This report released for sale to the public 12 June 61.

DESCRIPTORS: Human engineering, Design, Standards, *Display systems, Maintenance, *Control systems, Automation, *Guided missiles, Surface to surface.

This exhibit was prepared for design engineers. It sets forth design principles and practices, both general and specific, to be used in designing equipment for maximum utilization by operator and maintenance personnel. In addition, this exhibit is an attempt to provide a basis for design standardization within and among systems.

PB 156 307 $1.60

Air Force Ballistic Missile Div., Air Research and Development Command, Inglewood, Calif.
INSTRUCTIONS FOR SERIALIZING BALLISTIC MISSILE AND SPACE SYSTEM COMPONENTS AND ASSEMBLIES. 1 Oct 60, 15p. WDT Exhibit 57-17; Supersedes WDT Exhibit 57-17 of 5 Feb 58, amendment 27 Apr 59.

This report released for sale to the public 12 June 61.

DESCRIPTORS: *Guided missiles, Surface to surface, *Spaceships, Military requirements, *Electronic equipment, Reliability, Data processing systems.

This exhibit establishes the requirement for serialization of selected components, subassemblies and assemblies of Missiles, Ground Guidance, Ground Operating and Ground Support Equipment and Direct Support Real Property Installed Equipment, and the submission of data to the Air Force of the serialized components contained in each item delivered to the Air Force Manager in support of the operational program.

PB 154 235 $4.60

Air Force Cambridge Research Labs., Bedford, Mass.
PRODUCTION OF EXOSPHERIC DIPOLE CLOUDS, by F. Vilbig. Sep 60, 49p. 1 ref. AFCRC-TR-60-164; AD-249 595.

DESCRIPTORS: *Reflectors, *Communication systems, *Communication equipment, *Orbital flight paths, Mathematical analysis, *Satellite vehicles.

Reflecting dipole clouds for communication purposes can be set over the two earth poles, if the dipoles are traveling in different circular polar orbits but at equal altitude. Dipole clouds can also be set over any point on the earth between + or - 63.5 degrees latitude, if the dipoles move in one plane in different elliptical orbits, but all have the same perigee altitude and the same elevation angle i = 63.5 degrees, so that the influence of the oblateness effect can be eliminated. (Author)

PB 156 111 $1.60

Air Force Missile Test Center, Patrick AFB, Fla.
MOD. II RADAR ERROR MARGIN PRESENTATION FOR RANGE SAFETY ESTIMATES, by Martin J. Gould and A. E. Hoffmann-Heyden. Nov 56, 17p. Quality Control Technical note no. 24; AFMTC-TN-56-77; AD-96 631.

This report released for sale to the public 14 June 61.

DESCRIPTORS: Guided missiles, Test facilities, *Guided missile tracking systems, Safety, *Radar tracking, Errors, *Guided missile trajectories, Analysis, Range, Flight paths.

A graphical method is presented in which confidence limits for the radar track are presented with the nominal anticipated flight path on the plotting chart. In this way the allowable apparent deviations off-course and their bearing relative to the missile velocity vector diagram can be judged with good discrimination even in the absence of a low-noise track. The ideal presentation is for guide lines to be placed on either side of the nominal trajectory. To the extent that the nominal trajectory represents the actual trajectory, this should lead to all deviations falling within the guide lines. If the missile deviates from its anticipated flight path so far that its plot leads outside the radar error margin, the deviation can still easily be compared to the width of the radar error margin at this point. Visual inspection together with the previous experience of the range safety officer permits discrimination between true deviation and radar error margin. Problems encountered at the early part of trajectory are listed; and samples from actual missile trajectory are presented.

PB 156 116 $25.25

California Inst. of Tech., Pasadena.
BALLISTIC DATA: FIN-STABILIZED AND SPIN-STABILIZED ROCKETS, by Joseph Foladare. Final technical rept. for 15 July 45 on Contract OEMsr-418, continuation of Contract OEMsr-250. 27 Mar 46, declassified 7 Apr 58, 407p. OSRD rept. no. 2544; ATI-23 494.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Rockets, Rocket trajectories, *Ballistics, Data, *Spin-stabilized ammunition, *Fin-stabilized ammunition.

The interior and exterior ballistic data on U. S. rocket projectiles are summarized. Data are included for all projectiles upon which adequate tests were made. The book is divided into two parts: Part 1, fin-stabilized rockets, and Part 2, spin-stabilized rockets. Part 1 is further divided into sections according to the general purpose of the projectile; Part 2 is divided into two sections separating the 3.5-in. from the 5.0-in. rounds. Complete rounds are listed within each section by Navy mark number or CIT number. The data presented for all rockets, except the forward-firing aircraft rockets and spin-stabilized rockets, were obtained when propellant powder of JP composition was being used. For the forward-firing aircraft rockets and spin-stabilized rockets the data are for JPN composition powder. (Author)

PB 155 305 $13.00

Convair, San Diego, Calif.
PROJECT DEFENDER. Scientific rept. no. 4, 1 June-30 Nov 60, on Contract AF 19(604)5554. 31 Dec 60, 189p. 81 refs. ARPA Order no. 116-60; ZPh-075; AD-252 819.

DESCRIPTORS: *Guided missiles, Particles, Magnetohydrodynamics, Ion bombardment, Plasma physics, Scattering, *Gas ionization, Thermal radiation, *Reentry vehicles, Surface properties, Superaerodynamics, Hypersonic flow, Secondary emission.

Contents:
LAUNCH-PHASE RADIATION
MID-COURSE

"Structure of a plane electrohydrodynamic shock in a 'collision-free' plasma"
"Rarefied hypersonic flow over a sphere"
"Experimental electrohydrodynamics"
Microwave resonances
Surface-particle interactions
Vacuum phase radiation
Laboratory support

UCRL-6244 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
A NEW EXPLOSIVE COMPATIBILITY TEST, by J. W. Frazer. Rept. on Contract W-7405-eng-48. Nov 60, 23p.

PB 171 820 $0.75

Naval Ordnance Lab., White Oak, Md.
CHARACTERIZATION OF SQUIB MK 1 MOD 0. DETERMINATION OF THE STATISTICAL MODEL, by L. D. Hampton and J. N. Ayres. 30 Jan 61, 25p. 5 refs. NAVWEPS rept. 7347; AD-254 516.

DESCRIPTORS: *Electric igniters, *Electric detonators, Tests, Capacitors, Statistical functions, Igniters.

Nearly 8,000 Squibs Mk 1 Mod 0 were fired with a 4.00-microfarad capacitor in order to provide data to serve as a basis of deciding on a proper statistical distribution function to express the response of the squib to adiabatically delivered electrical energy pulses. The Log-Logistic Model (expressed in cumulative form by $\ln [p/(1-p)] = M \log_{10} D + B$) was found to be not completely satisfactory but considerably better than the Log-Gaussian Model. With the use of suitable tolerance intervals, the Log-Logistic Model can be made to include the observed data. A direction is indicated which future work might take in developing a more accurate statistical model. (Author)

PB 171 819 $1.50

Naval Ordnance Lab., White Oak, Md.
STANDARDIZATION OF THE SMALL SCALE GAP TEST USED TO MEASURE THE SENSITIVITY OF EXPLOSIVES, by J. N. Ayres. 16 Jan 61, 60p. 8 refs. NAVWEPS rept. 7342; AD-254 060.

DESCRIPTORS: *Explosives, Sensitivity, Measurement, *Test methods, Standardization, PETN, RDX, Detonation, Loading, Statistical analysis.

A revised small scale gap test (SSGT) has been developed. It employs a 1.4-inch long, 0.2-inch diameter RDX column loaded in a brass cylinder as a donor. The acceptor is of similar configuration. The sensitivity of the explosive loaded in the acceptor is determined by the test as a function of the thickness of the lucite barrier which is used to moderate the donor output. The mean firing sensitivity, for instance, is determined from the thickness of lucite at which 50% response would be expected. By revision of methods and design, and by careful control of the loading and the testing conditions, the resolution of the revised SSGT has been improved by a factor of 4 to 5 over that of the original SSGT. (Author)

PB 156 339 $16.50

Office of Scientific Research and Development. Div. 1.
INTERIOR BALLISTICS. A CONSOLIDATION AND REVISION OF PREVIOUS REPORTS, INTERIOR BALLISTICS I TO VII, INCLUSIVE, by C. F. Curtiss and J. W. Wrench, Jr. (Geophysical Lab., Carnegie Institution of Washington). Rept. on Contract OEMsr-51. 15 July 45, declassified 1 Sep 59, 257p. NDRC rept. no. A-397; OSRD rept. no. 6468; ATI 24 855.

This report released for sale to the public 19 June 61.

DESCRIPTORS: Guns, *Interior ballistics, Theory, Mathematical analysis, Design.

A study was made of the fundamental ballistic equations and the solutions of these equations are presented. Various tables which aid in the solution of many types of ballistic problems are given with examples of the solution of typical problems. A discussion of the numerical quantities used in the solution of problems, and studies related to interior ballistics is included. With respect to second-order effects, it is assumed that the powder gas is distributed according to Keat's solution of the problem of the motion of powder gas. The assumption is also made that heat lost to the bore up to any instant is proportional to the square of the velocity. Friction of the projectile is taken as equivalent to a resisting pressure on the base of the projectile equal to a constant fraction of the average pressure.

PB 155 338 $3.60

Polytechnic Inst. of Brooklyn, N. Y.
OPTIMUM ORBITAL TRANSFER BY HIGH THRUST ROCKETS, by Lu Ting. Rept. on Contract AF 49(638)445. Feb 61, 33p. 7 refs. PIBAL rept. no. 633; AFOSR-163; AD-253 306.

DESCRIPTORS: *Rockets, *Rocket trajectories, *Orbital flight paths, Mathematical analysis, *Satellite vehicle trajectories, Geometry, *Guided missile trajectories, Fuel consumption, Analysis, Thrust, Calculus of variations.

For a high thrust rocket, the specific impulse is of the order of or larger than the local circular orbital velocity, and the fuel consumption rate is so large that the dimensionless parameter, epsilon, defined as the ratio of the product of initial weight and specific impulse to that of the fuel consumption rate and a reference radial distance to the earth's center of the common focus, is much less than unity. The solution of transfer by a single impulse is shown to be equivalent to the true optimum transfer by a high thrust rocket when terms of the order of epsilon are neglected.

With the aid of the approximate theory for variational problems, developed in a previous paper, the solution of transfer by a single impulse is improved so that the result will differ from the true optimum by the order of epsilon squared only. Explicit formulas for the improvements in the total burning time and in the thrust angle program are obtained. With application of these formulas to each impulse transfer, it is shown that an optimum solution of transfer by N-impulse can be improved. (Author)

PB 156 334 $11.50

Sandberg-Serrell Corp., Pasadena, Calif.
RANDOM ACCELERATION TEST FACILITY DESIGN CRITERIA, by Robert H. Stivers. Rept. on Contract AF 04(611)2047. 15 Oct 57, 158p. Rept. R324-5; AD-145 649.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Acceleration, *Test facilities, Design, Guided missiles, Vibration.

Design requirements are presented for a random acceleration test facility which will be located in the vicinity of the Hydrodynamics Laboratory at the Rocket Test Laboratory, Edwards AFB. The facility will be used in correcting and optimizing missile design, and will provide a nonhazardous, relatively economical means of observing vibration effects on missile behavior. Facilities will conform, in general, to sizes, locations, types of construction, and equipment indicated the planning drawings and criteria, insofar as such are applicable and practicable when subsurface conditions are known. Structural callouts, evaluations, and other information shown on planning drawing will be verified during the final design phase. The facility will include a tower equipped with a soft mount and shaker, a pumphouse containing power supply equipment for the soft mount and shakers, a shop with boiler and terminal rooms, a control building, provisions for future installation of temperature conditioning facilities, and other necessary back-up facilities. Missiles to be tested will be subjected to controlled vibrations (amplitudes to $\pm$ 1 in., frequencies to 1000 c); these vibrations will simulate selected in-flight vibrations. Nonhazardous liquids will be circulated in the propulsion system during tests in lieu of actual propellants to minimize hazards and to simulate in-flight propellant mass and dynamic effects; non-firing tests only will be conducted.

SC-4574(RR) $0.75
Sandia Corp., Albuquerque, N. Mex.
HIGH EXPLOSIVE CRATER STUDIES: TUFF, by B. F. Murphey. Apr 61, 30p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

PB 155 570 $9.10
Boulet, Georges (France).
DESIGN, CONSTRUCTION AND TEST OF TWO CONSTANT VOLUME COMBUSTION CHAMBER, by Georges Boulet. Technical final rept. on Contract AF 61(514)1162. 30 June 59, 107p. AFOSR-TR-59-164; AD-232 200.

DESCRIPTORS: *Combustion chambers, Gas turbines, Design, Tests, Turbojet engines, Turbopropeller jet engines, Locomotives.

A combustion chamber was developed for use in gas turbine engines. Calculations and diagrams are presented to illustrate the feasibility of the chamber in gas turbine-driven locomotives and automobiles and in turbojet and turboprop aircraft engines.

PB 156 284 $6.60

General Electric Co., Evendale, Ohio.
PARAMETER ANALYSIS TO DEVELOP A PRACTICAL THRUSTMETER SYSTEM FOR THE J79 PHASE I TURBOJET ENGINE, by R. E. Chase, J. A. Elgin, and M. A. Fischer. Rept. on Percent Thrust Instrumentation Techniques Development, Contract AF 33(616)3962. May 59, declassified 15 Jan 60, 62p. 23 refs. WADC Technical rept. 59-54; AD-243 909.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Turbojet engines, *Thrust, *Thrust meters, Test methods, Mathematical analysis, Instrumentation, Measurement.

The parameter systems developed for indicating thrust demonstrated excellent correlation. These systems did not achieve the desired results when an error analysis, based on sensor and transducer inaccuracies, was conducted. Depending on the accuracy of the components employed, several gross thrust systems appear feasible for future consideration. Gross thrust, based on the analysis to date, appears the most promising for reduction to practice and can fulfill the three basic requirements of a thrustmeter. These three requirements are take-off thrust check, cruise control, and engine thrust balancing. Net thrust as derived by subtracting ram drag from gross thrust produced very poor results. The reference systems developed show promise, but they will require additional refinement before they are mechanized. Extended engine testing and sensor development will be required to produce an accurate per cent indication of engine thrust. (Author)

PB 156 274 $2.60

Naval Research Lab., Washington, D. C.
INSTANTANEOUS TYPE SHAFT REVOLUTION SYSTEM, by W. B. Roberts. Test rept. for Nov 34-Jan 35. 24 Jan 35, 22p. 2 refs. NRL rept. no. B-1118.

This report released for sale to the public 13 June 61.

DESCRIPTORS: Synchros, Electric motors, Marine engines, Operation, *Shafts, Rotation, *Crankshafts, Specifications, Shock, Tests, Naval research.

The system was set up and its operation closely observed while under test for endurance, accuracy and shock integrity. At the start and finish of the 500 hours endurance test, the recorded revolutions on the port and starboard transmitter mechanical counters and the port and starboard and averaging counters were logged.

While under endurance, the system was operated at an average speed of 317 RPM and the direction of rotation of the transmitter shafts was reversed for one hour in every twenty-four. At the conclusion of this test, the system was operated for accuracy. Then one of the shaft transmitters was subjected to shock and the system again operated for accuracy. (Author)

ORNL-3031 $1.25

Oak Ridge National Lab., Tenn.
THE HIGH SPECIFIC IMPULSE, ARC-ION SYSTEM, by J. S. Luce and J. W. Flowers. Rept. on Contract W-7405-eng-26. 50p.

PB 155 472 $9.10

Rocketdyne, Canoga Park, Calif.
TRANSVERSE GAS MOTIONS IN CYLINDRICAL AND ANNULAR THRUST CHAMBERS, by I. Mirsky. Rept. on Contract AF 49(638)817. 28 Feb 61, 110p. 6 refs. R-2903; AFOSR-124; AD-253 078.

DESCRIPTORS: Acoustics, *Fluid mechanics, Gas flow, Particles, Motion, Equations, Equations of state, Stability, Thrust, *Combustion chamber gases, *Rocket motors, *Combustion chambers.

An analytical study is made of finite amplitude pressure waves transverse to the axis of baffled and unbaffled full and annular thrust chambers. The nonlinear equations of motion for a compressible viscous fluid without combustion are solved to a second-order approximation. (Author)

Manufacturing Equipment and Processes

PB 156 340 $2.60

Massachusetts Inst. of Tech. [Cambridge]
MOLYBDENUM WELDING, by James H. Johnston and John Wulff. Rept. on Contract AF 33(616)361. July 53, 24p. 11 refs. WADC Technical rept. 53-260; AD-22 979.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Molybdenum, *Welding, Arc welding, Welds.

Inert-arc and atomic hydrogen weldments of commercial molybdenum do not possess room temperature ductility. Inert-arc weldments made in a large enclosure in streaming purified helium only occasionally gave joints which possessed a slight measure of ductility. Although maximum elongation of 3 per cent was obtained in one weldment made in a specially-constructed glass apparatus and in highly purified helium, the average ductility obtained, from using this method. was unsatisfactory. Butt-welding of commercial molybdenum in hydrogen and helium was also unsuccessful. Butt-weldments practically as strong as the parent metal were made in chlorine, carbon tetrachloride, and in water. When the welding temperature at the joint was about 1500°C or below, no room temperature ductility was achieved. The large reductions in area found on tensile tests of butt welds made at higher temperatures in carbon tetrachloride have been attributed to the effectiveness of hot working rather than to the actual temperature of weld employed. (Author)

PB 156 292 $1.60

Polytechnic Research and Development Co., Inc., Brooklyn, N. Y.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH-STABILITY RESISTORS 9.10, by H. W. Aschinger. Quarterly progress rept. no. 1, 1 Aug-31 Oct 56, on Contract DA 36-039-sc-72730. 16 Nov 56, 18p.

This report released for sale to the public 13 June 61.

DESCRIPTORS: *Resistors, Stability, Industrial production, *Manufacturing methods, *Electrical industry Tests, materials.

Necessary development work was undertaken as a preliminary to the design and construction of production facilities. Processes requiring such development are collaring, evaporation of metal film, spiralling, termination attachment of leads to substrate, capping, and encapsulation. The progress made in the development of these processes is detailed.

PB 156 293 $1.60

Polytechnic Research and Development Co., Inc., Brooklyn, N. Y.
INDUSTRIAL PREPAREDNESS STUDY FOR PRECISION, HIGH-STABILITY RESISTORS 9.10, by H. W. Aschinger. Quarterly progress rept. no. 2, 1 Nov 56-31 Jan 57, on Contract DA 36-039-sc-72730. 25 Feb 57, 16p. AD-124 223.

This report released for sale to the public 13 June 61.

DESCRIPTORS: *Resistors, Stability, *Industrial production, *Manufacturing methods, *Electrical industry, Tests, Materials.

See also PB 156 292

MATERIALS

PB 156 305-1 $19.75

Douglas Aircraft Co., Inc., Santa Monica, Calif.
MATERIALS HANDLING SUPPORT SYSTEM 463L. VOLUME I. Summary rept. on Contract [AF] 33(600)39338. May 60, 346p. 119 refs. WADD-TR-60-114(I); AD-252 820.

This report released for sale to the public 8 June 61.

DESCRIPTORS: *Materials, *Handling, *Cargo, *Air force logistics, Air transportation, Warehouses, Cargo vehicles, Transportation, Logistics, Supply depots, Transport planes, Supplies, Packaging, Air force operations, Air force supplies, Containers.

The report presents the results of a 10-month study

effort, which cover all areas of the problem of a materials handling system for the Air Force logistic mission from the supplier or manufacturer to the user. Specific areas of ground and aircraft cargo handling; terminal design and operation; and freight preparation, processing, documentation, marking, and labeling have been investigated. Supported by a comprehensive military cargo traffic analysis, specific conclusions and recommendations have been derived for an efficient and economical logistic operation. The appendix to this report contains technical supporting data to expand, where needed, recommendations and conclusions of the basic report. For purposes of referencing to the Appendix, Volume II, the following system has been adopted: The letter A preceding the first digit indicates the part in the Appendix referenced. The second digit indicates the paragraph, figure, or table number in that part of the Appendix. (Author)

PB 156 305-2 $36.00

Douglas Aircraft Co., Inc., Santa Monica, Calif.
MATERIALS HANDLING SUPPORT SYSTEM 463L. VOLUME II. Summary rept. on Contract [AF] 33(600)39338, May 60, 926p. 113 refs. WADD-TR-60-114(II); AD-252 821.

This report released for sale to the public 8 June 61.

DESCRIPTORS: *Materials, *Handling, *Air force logistics, *Cargo, Air transportation, Warehouses, Cargo vehicles, Transportation, Logistics, Supply depots, Transport planes, Supplies, Packaging, Air force operations, Air force supplies, Containers.

PB 171 838 $0.75

Quartermaster Research and Engineering Center, Natick, Mass.
"QUARPEL" WATER- AND OIL-RESISTANT TREATMENT FOR TEXTILES, by Carlo G. DeMarco, Gil M. Dias, and William F. Smith. Apr 60, 25p. 9 refs. Textile Series rept. no. 111; AD-237 329.

DESCRIPTORS: *Textiles, Fluorocarbons, Moisture-proofing, *Coatings, Clothing, Penetration, Absorption, Tests, Test methods, *Finishes, Physical properties, Organic compounds.

The development of a durable water- and oil-resistant treatment for textiles is described. This finish, which has been identified as Quarpel, is a combination of a quaternary salt and a perfluoro compound applied from a single bath system. Comparative data presented show the superior performance of this treatment and for the first time present performance standards of a truly durable water resistant finish. (Author)

AD-255 653 repriced $0.75

Rock Island Arsenal Lab., Ill.
ELASTOMERIC COATINGS FOR ALUMINUM COMPONENTS OF ROCKET LAUNCHERS, by T. Rice and T. A. Turner. 31 Jan 61, 23p. 4 refs. Rept. no. 61-388.

DESCRIPTORS: Rocket launchers, Aluminum, *Elastomers, *Coatings, Blast effects, Tests, *Refractory coatings, *Heat resistant paints.

Thirty formulations of various coatings have been subjected to the effects of a 3.5 inch rocket blast test. Four classes of materials showed the most promise for heat and abrasion resistance. They are fluoroelastomers, polyurethanes, fused epoxies and epoxy-polysulfide blends. The best adhesion on aluminum is obtained on primed surfaces. (Author)

Y-1301 $1.00

Union Carbide Nuclear Co., Oak Ridge, Tenn.
PRODUCTION, PRECISION FORMING, AND SINTERING OF CERAMIC-GRADE UO_2, by A. J. Caputo and J. E. Perry. Rept. on Contract W-7405-eng-26. 16 Mar 61, 37p.

ORO-359 $0.50

Weather Bureau Research Station, Oak Ridge, Tenn.
TIME EXPOSURE PHOTOGRAPHY OF SMOKE PLUMES, by W. M. Culkowski. Apr 61, 20p.

Fuels, Lubricants, and Hydraulic Fluids

PB 156 308 $4.60

Atlantic Research Corp., Alexandria, Va.
INVESTIGATION TO DETERMINE THE BUILD-UP OF A STATIC ELECTRIC FIELD CHARGE IN A ROLLING FLUID TRANSPORTER, by Michael Markels, Jr. Final rept. Phase I on Contract DA 44-177-tc-461. 15 Mar 58, 45p. 16 refs.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Static electricity, Production, *Fuels, *Transportation, Hazards, Safety.

The purpose of the work covered by this report was to determine if discharges of static electricity occurred inside the rolling fluid transporter of sufficient intensity to ignite a flammable mixture in the vapor space above the fuel. The program included a theoretical investigation to guide the experimental effort, to determine the conditions of greatest hazard, and to provide a basis for recommendations of changes in the design and operation of the transporter to correct any deficiencies. The experimental program included addition of a photomultiplier tube mounted on the axle inside the bag to scan the interior during operation. Light from static discharges was detected by the photomultiplier tube and data displayed on an oscilloscope. During operation, with the transporter half full of JP-4 fuel and pressurized with nitrogen for safety, sparking with energy more than ten times the minimum required for hydrocarbon ignition was detected.

AD-255 319 repriced $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
FIELD TESTS OF MIL-H-46046 (ORD), HYDRAULIC FLUID NON-PETROLEUM BASE, AUTOMOTIVE (PRESERVATIVE AND LIMITED OPERATIONAL) by Charles B. Jordan. 15 Mar 61, 18p. 6 refs. CCL #102.

DESCRIPTORS: *Hydraulic fluids, *Hydraulic brakes, Preservation, Design, Tests.

PB 156 277 $3.60

Naval Research Lab., Washington, D. C.
THE LUBRICATION OF HIGH-SPEED GYROS, by J. E. Brophy and J. B. Romans. Final rept. 3 Aug 51, declassified 15 Dec 53, 31p. 15 refs. NRL rept. 3840; ATI-114 396.

This report released for sale to the public 13 June 61.

DESCRIPTORS: *Gyroscopes, Tests, *Lubrication, Bearings, Failure (Mechanics), Maintenance, Gun sights, Operation, *Lubricants, Military requirements.

When operated with specified lubricants, many gyroscopes used in service and taken from storage experienced short life due to rotor-bearing failures. As a result, a project was established not only to develop improved lubricants for naval gyroscopes, but also to replace proprietary lubricants by one or two lubricants to be specified in the future. Typical gun sight gyroscopes studied included those from the Mark 15 air-driven gun sight, the electrically driven Mark 20 gun sight and the Mark 6 stable element. New high-speed gyroscopes studied included the general purpose, 24,000-rpm, Mark 24 evacuated type. Measurements were made of bearing temperatures, rotor speed, rate of deceleration, power input, and bearing noise level, the noise components being analyzed.

PB 171 831 $1.50

United States Rubber Co., Mishawaka, Ind.
DEVELOPMENT OF A 50,000 GALLON SUBMERSIBLE FUEL CACHE, by C. B. Rodenbach. Rept. for 15 July 59-31 Dec 60 on Underwater Fuel Cache, Contract Nonr-2957(00). Dec 60, 59p.

DESCRIPTORS: *Fuel storage tanks, Design, *Underwater equipment.

The prototype assembly contained all of the component parts necessary to fill and discharge fuel including metering and safety devices and, therefore, is considered the principal segment of a full scale underwater fuel cache wherein multiple tanks would be manifolded through a common header tank. The work performed on this contract has proved that it is feasible and practical to store liquids in flexible containers under water. The installation of the prototype assembly was made within a few hours time without encountering any major difficulties. The tank, while anchored on the floor of the ocean at a 52' water depth, was filled to rated capacity within one hour and also drained within one hour. The removal of the assembly was accomplished within a few hours time without experiencing any major problems. The assembly was on test in the Gulf of Mexico for five months during which time two storms with resultant waves of approximately 15' height occurred. It is considered that the prototype submersible fuel cache has met the design objectives of the contract.

Paints and Finishes

PB 156 275 $2.60

Naval Research Lab., Washington, D. C.
AN INVESTIGATION OF INFRA-RED REFLECTING PAINTS, by James S. Strong. 7 Dec 42, 22p. NRL rept. no. P-1969.

This report released for sale to the public 14 June 61.

DESCRIPTORS: Ship decks, *Paints, Tests, Temperature, Reflection, Infrared radiation.

The object of the study was to compare infra-red reflecting deck paints against the Bureau's standard formula 20B deck paint in order to determine the temperature differences their use would make in the compartments under the weather deck. The foregoing was modified after a conference to determine the temperature of the panels only, to find out whether any lower temperature resulted by the use of infra-red reflecting paints rather than the Bureau's standard formula 20B deck paint.

PB 156 276 $2.60

Naval Research Lab., Washington, D. C.
THE OPTICS OF PAINTS: SPECTRAL REFLECTIVITY OF PHILADELPHIA NAVY YARD INFRA-RED REFLECTING DECK PAINTS, by J. A. Sanderson. 17 Aug 43, 28p. 8 refs. NRL rept. no. H-2140.

This report released for sale to the public 14 June 61.

DESCRIPTORS: Ship decks, *Paints, Optics, Reflection, Measurement, Reflectometers, Infrared radiation.

Diffuse spectral reflectivity measurements have been made over the wavelength range 0.6 to 2.5μ on an infra-red reflecting deck paint prepared in a pebblemill by the Philadelphia Navy Yard and on six modifications of it including the addition of contaminants and variations in grinding procedure. From these results integrated reflection factors for infra-red sunlight in the interval 0.76 to 2.4μ were obtained. It was found that the paint reflected 89 percent as much of this light as a brilliant white paint when applied over a white undercoat and 78.5 percent as much when applied over black. By taking into account the true reflectivity of the white paint it was estimated that these numbers correspond to reflection of 38 and 33 percent, respectively, of the whole solar spectrum representing a considerable reduction in the absorption of sunlight by surfaces to which the paint is applied. Fineness of grinding was of greater effect on these paints than contamination by steel particles from the roller mill. A simple over-all reflectometer embracing the near infra-red spectral interval 0.75 to 2.6μ is described. Measurements made with it indicate its usefulness as a control instrument.

AD-255 980 repriced $2.00

Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT AND EVALUATION OF HIGH-TEMPERATURE RESISTANT COMPOSITE PLASTIC PLATES, by Howard Christie and Thomas Medved. Final rept. for 15 Dec 59-14 Feb 61 on Contract NOas-60-6099-c. 28 Feb 61, 79p. 9 refs.

DESCRIPTORS: Heat resistant polymers, *Plastics, *Epoxy resins, Thermosetting resins, *Aircraft canopies, Acrylic resins, Epoxides, Synthesis, Physical properties, Temperature, Tensile properties.

The tensile and flexural properties were determined for the resin obtained from the diglycidyl ether of bisphenol A and 6.5 pph of trimethoxyboroxine. The resin has high ultimate flexural and tensile strengths (20,810 psi and 13,090 psi, respectively, at 76°F). The strength retention up to 300°F has been determined. About 5 per cent of the 76°F flexural strength is retained at 300°F. This cured resin should be usable in three-layer canopies at skin temperatures up to 350°F. Maximum thermal rigidity was obtained from the hexahydrophthalic anhydride - vinylcyclohexene dioxide resins at a ratio of 0.7 to 0.8 mol anhydride per mol equivalent epoxide (1.4 to 1.6 mol HHDA per mol VCHDO). Endomethylenetetrahydrophthalic anhydride, when used at ratios of 0.7 to 0.8 mol per mol equivalent epoxide as VCHDO, produces resins that have heat distortion temperatures above 525°F. The endomethylenehexahydrophthalic anhydride produces resins with heat-distortion temperatures in the 450°F range. A film-forming mold release agent was developed for releasing epoxide resins cast in plate glass molds. The syntheses of novel epoxide resins are discussed.

PB 156 280 $3.60

Plastics Lab., Princeton U., N. J.
THE EFFECT OF FABRICATION CONDITIONS ON THE DUCTILE-BRITTLE TRANSITION IN POLYETHYLENE, by T. S. Brazier and B. Maxwell. Rept. on Contract DA 36-039-sc-78105. 1 July 59, 38p. 15 refs. Technical rept. 54B; AD-219 287.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Ethylenes, *Polymerization, Mechanical properties, Production, Tests, Temperature, Pressure, Cooling, *Plastics, *Polymers, Crystal structure, Molecular weight, Fracture (Mechanics), Stresses.

The effect of the fabrication conditions of temperature and pressure during the cooling of linear polyethylene has been studied with regard to the ductile-brittle transition under both short and long time tensile tests. The inter-relationship of various polymer structure variables such as molecular weight and degree of branching with fabrication variables on the brittle fracture time has been demonstrated. By proper pressure and cooling rate it is possible to produce long time resistance to brittle fracture even with low molecular weight (high melt index) linear polyethylene. (Author)

NAA-SR-5958 $1.25

Atomics International, Canoga Park, Calif.
FUGUE: A NONDIMENSIONAL METHOD FOR DIGITAL COMPUTER CALCULATION OF STEADY STATE TEMPERATURE, PRESSURE, AND VOID FRACTION IN PIPE FLOW WITH OR WITHOUT BOILING, by R. C. Noyes, F. Bergonzoli, and J. E. Gingrich. Rept. on Contract AT(11-1)-GEN-8. 30 May 61, 37p.

WAPD-TM-274 $1.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
THE TWO-DIMENSIONAL, QUADRUPLE P_0 AND P_1 APPROXIMATIONS, by R. C. Gast. Rept. on Contract AT-11-1-GEN-14. Mar 61, 42p.

PB 155 606 $8.60

California U., Berkeley.
FUNCTIONS VALUED IN VARIABLE NORMED SPACES, by Francois Treves. Technical rept. no. 2 on Contract AF 49(638)604. Jan 61, 95p. AFOSR TN-60-1201; AD-254 116.

DESCRIPTORS: *Functions, Topology, Measure theory.

Conditions are investigated under which the concepts and methods of analysis can be extended to functions defined in a set X and whose values at each point x of X lie in a set E(x) depending on x. Here the sets E(x) are normed (real or complex) vector spaces. Only very fundamental aspects are studied: In Chapter II, continuity, measurability and integration; and in Chapter III, differentiability of those functions. The arguments of Chapter II follow essentially the trend developed by various authors, especially in the theory of representations of algebras. The main difference is that a structure is sought where possibly no continuous functions on open sets (beside the zero section) exist, although a meaningful theory of integration can be built. That has led to defining continuity on every subset of the "base space" X by using a suitable structure given over this subset. An other difference is that one weakens substantially the condition on the norms of the "regular" functions. Chapter III is concerned with the definition of differentiable "sections", which, in some sense, constitutes the core of the article. Examples of a general nature are given. (Author)

PB 155 607 $2.60

California U., Berkeley.
ON QUOTIENT VARIETIES AND THE AFFINE EMBEDDING OF CERTAIN HOMOGENEOUS SPACES, by Maxwell Rosenlight. Technical rept. no. 8 on Contract AF 49(638)603. Jan 61, 24p. 5 refs. AFOSR-27; AD-254 675.

DESCRIPTORS: *Groups (Mathematics), *Algebra, Transformations, (Mathematics), Theory.

PB 155 177 $1.60

California U., Berkeley.
A PROPERTY OF THE SYMPLETIC GROUP, by Douglas Maurer. Technical rept. no. 17 on Contract AF 49(638)79. Nov 60, 12p. 8 refs. AFOSR-TN-60-908; AD-252 644.

DESCRIPTORS: Matrix algebra, *Algebras, Groups (Mathematics).

PB 154 237 $1.60

Case Inst. of Tech., Cleveland, Ohio.
ESTIMATION OF SAMPLE SIZE, by N. L. Johnson. Rept. on Contracts AF 49(638)361, and [AF 49(638)603]. Nov 60, 17p. 2 refs. Case Computing Center publication no. 1038; AFOSR-28; AD-249 551.

DESCRIPTORS: *Sampling, Probability, Statistical data, Test methods, Reliability, Statistical distributions, Integral equations, Arithmetic progressions.

The problem is considered of estimating the total number of individuals in a sample, given a number of the observations in the sample ranked either from the greatest or the least. Attention is directed especially to the case when the r smallest values in the sample are known; and the population distribution of the observed character is also known. In this case the largest of the observations (i.e. the r-th smallest in the complete sample) is a sufficient statistic for the sample size. This is also true if the r-th smallest and any subset of the (r-1) smaller observations are available. Methods of estimation by (a) discriminant analysis (b) maximum likelihood, and (c) confidence intervals are discussed. (Author)

PB 156 333 $9.60

[Electronic Systems Lab.] Mass. Inst. of Tech., Cambridge.
A STUDY OF INCREMENTAL COMPUTATION BY DIFFERENCE EQUATIONS, by Frank B. Hills. Rept. on Contract AF 33(616)5477. May 58, 114p. 19 refs. Rept. 7849-R-1; AD-160 015.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Integration, *Difference equations, *Computers, Analog computers, Digital computers, Programming, Errors.

The shortcomings of previous computation approaches to computers can be overcome by working with a description of the computation process which is based on a difference-equation formulation. This description is used here to investigate the characteristics of incremental integration. In particular, the causes and propagation of truncation and round-off errors are investigated. Also investigated are two other errors: (1) drift due to the variable to integration changing from increasing to decreasing or vice versa, and (2) method errors, so-called because of their direct connection with the method of solution. The investigations cover not only the magnitude and causes of these errors, but means are presented for reducing their effect or eliminating them altogether. (Author)

PB 154 249 $4.60

Johns Hopkins U., Baltimore, Md.
ON DIFFERENTIAL EQUATIONS AND THE FUNCTION $J_\mu^2 + Y_\mu^2$, by Philip Hartman. Technical note no. 19 on Contract AF 18(603)41. Nov 60, 43p. 13 refs. AFOSR TN-60-1374; AD-251 487.

DESCRIPTORS: *Differential equations, Bessel functions.

Let q(t) be real-valued for $t > 0$. In the first part of the analysis, there are derived simple conditions which imply that (1) $u'' + q(t)u = 0$ has a pair of real-valued solutions $u = x(t), y(t)$ with the property that $z(t) = x(t) + iy(t)$ satisfies the absolute value of $|z|$ being > 0, the absolute value of z' being $<$ or $=$ to 0, the absolute value of z" being $>$ or $=$ to 0, or the absolute value of z being $>$ zero, the absolute value of z' being $>$ or $=$ to 0, the absolute value of z" being $<$ or $=$ to 0. This gives a short differential equation proof for the known monotony properties of the absolute value of z(t), where $z(t) = t^{\frac{1}{2}}(J_\mu + iY_\mu)$ and J_μ, Y_μ are Bessel functions of order $\mu >$ or $=$ to 0. It is also shown that if q has a completely monotone derivative and 0 is $< q(\infty)$ which is $<$ or $=$ to ∞, then (1) has a solution $z(t) = x(t) + iy(t)$ with the property that the absolute value of $|z(t)|^2$ is completely monotone. (Author)

PB 154 248 $1.60

Johns Hopkins U., Baltimore, Md.
ON EXISTENCE IN THE LARGE OF SOLUTIONS OF HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS, by John P. Shanahan. Technical note no. 18 on Contract AF 18(603)41. July 60, 16p. 6 refs. AFOSR-TN-60-1060; AD-251 486.

DESCRIPTORS: *Partial differential equations, *Calculus of variations, Analysis, Theory.

Existence in the large of solutions of z with respect to x and y equals f as a function of x, y, z, p, and q where z(x, 0) and z(0, y) are prescribed is considered. Theorems proved are analogues of theorems in ordinary differential equations. An analogue of a theorem of Wintner in ordinary differential equations is shown. An analogue of another theorem of Wintner on the asymptotic behavior of solutions is also proved. (Author)

PB 154 250 $1.60

Johns Hopkins U., Baltimore, Md.
ON THE EXISTENCE OF LARGE OR SMALL SOLUTIONS OF LINEAR DIFFERENTIAL EQUATIONS, by Philip Hartman. Technical note no. 20 on Contract AF 18(603)41. Nov 60, 14p. 7 refs. AFOSR TN-60-1411; AD-251 488.

DESCRIPTORS: *Differential equations.

An analysis deals with a scalar differential equation (1) $u'' + q(t)u = 0$, a system of first order equations (2) $x' = A(t)x$, and a system of second order equations (3) $x'' + A(t)x = 0$ on a t-interval $0 <$ or $=$ to t, which in turn is $< w$ ($<$ or $=$ to ∞). It is concerned with the existence of solutions which are either unbounded or tend

to 0 as t → w. One result states, for instance, that if A(t) is Hermitian, positive definite, non-decreasing (or non-increasing) and det A(t) → ∞ (or 0) as t→ w, then (3) has a solution x = x(t) not congruent to 0 which tends to 0 (or is unbounded) as t → w. (Author)

ORNL-3082 $1.50

Oak Ridge National Lab., Tenn.
MATHEMATICS PANEL. Annual progress rept. for period ending 31 Dec 60 on Contract W-7405-eng-26. 60p.

PB 155 834 $2.60

Purdue U. [Lafayette, Ind.]
INTEGRATION WITH RESPECT TO OPERATOR-VALUED FUNCTIONS, by Gregers L. Krabbe. Rept. on Contract AF 49(638)505. 4 Aug 60, 28p. 20 refs. AFOSR-TN-60-857; AD-254 741.

DESCRIPTORS: *Integration, *Functions, *Operators (Mathematics), Functional analysis, Integrals, Transformations (Mathematics), Topology.

The basic problem is to integrate scalar-valued functions with respect to operator-valued functions that are not of bounded variation.

PB 155 835 $1.10

Purdue U. [Lafayette, Ind.]
INTEGRATION WITH RESPECT TO OPERATOR-VALUED FUNCTIONS, by Gregers L. Krabbe. Rept. on Contract AF 49(638)505. 15 Nov 60, 8p. 8 refs. AFOSR TN-60-1338; AD-254 742.

DESCRIPTORS: *Integration, *Functions, Integrals, *Operators (Mathematics), Algebras, Topology, Operational calculus.

PB 154 985 $5.60

Stanford U., Calif.
SIMPLE METHODS FOR CLASSIFICATION AND CONSTRUCTION OF SIMILARITY SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS, by D. E. Abbott and S. J. Kline. Rept. MD-6 on Contract AF 49(638)201. Oct 60, 51p. 62 refs. AFOSR TN-60-1163; AD-251 813.

DESCRIPTORS: *Partial differential equations, Classification, Aerodynamics, Mechanics.

Simple methods for establishing similarity solutions are given. The mathematical interpretation of the term similarity is a transformation of variables to achieve a reduction in the number of independent variables in the differential equations. Physically, the existence of a similarity usually implies the lack of a characteristic length in one or more coordinates of the problem. The approach used is to develop two methods for finding similarity variables based upon the mathematical technique of solving partial differential equations by separation-of-variables. The emphasis in both methods is on motivation. It is possible to classify physical problems into two mathematical categories: problems which are mathematically well-posed and those which are not. The two methods presented emphasize the fact that if a similarity variable is not found for the particular class of transformations assumed, it cannot be concluded that none exist, but only that there is no similarity variable under that class of transformations. The two methods for finding similarity solutions are developed and compared in terms for two well-known problems; the suddenly accelerated flat plate, and the classical Blasius solution for laminar flow over a flat plate. Finally, five other examples are given to illustrate the types of problems which can be treated and some refinements of technique which are possible. (Author)

PB 155 214 $3.60

Zator Co., Cambridge, Mass.
A GENERAL THEORY OF INDUCTIVE INFERENCE, by R. J. Solomonoff. Preliminary rept. on Contract AF 49(638)376. Nov 60, 34p. 1 ref. ZTB-138, rev. of Rept. V-131, Feb 60; AFOSR TN-60-1459; AD-252 445.

DESCRIPTORS: *Probability, *Sequences, Mathematical analysis, *Documentation, Language, Reading machines, Theory, Machine translation, Programming.

Some preliminary work is presented on a very general new theory of inductive inference. The extrapolation of an ordered sequence of symbols is implemented by computing the a priori probabilities of various sequences of symbols. The a priori probability of a sequence is obtained by considering a universal Turing machine whose output is the sequence in question. An approximation to the a priori probability is given by the shortest input to the machine that will give the desired output. A more exact formulation is given, and it is made somewhat plausible that extrapolation probabilities obtained will be largely independent of just which universal Turing machine was used, providing that the sequence to be extrapolated has an adequate amount of information in it. Some examples are worked out to show the application of the method to specific problems. Applications of the method to curve fitting and other continuous problems are discussed to some extent. (Author)

Computing Devices

AGN-TM-391 $1.25

Aerojet-General Nucleonics, San Ramon, Calif.
PECAN: A CYCLE ANALYSIS CODE FOR GAS TURBINE, NUCLEAR OR CONVENTIONAL POWER PLANTS (IBM 704 COMPUTER), by S. Luchter, W. J. O'Donnell, and W. C. Reynolds. Rept. on Contract AT(10-1)-880. Apr 61, 59p.

PB 154 896 $3.60

Air Force Cambridge Research [Labs.] Bedford, Mass.
EVALUATION OF VISUAL DISTANCE COMPUTER CP-384/GMQ(XD-1), by Philip I. Hershberg. Apr 60, 36p. 6 refs. Instrumentation for Geophysics and Astrophysics no. 13; AFCRC-TR-60-235; AD-250 585.

DESCRIPTORS: *Approach lights, *Visibility, Range, Range finding, *Computers, Airplane landings, Landing aids, Night landings, Digital computers.

The Visual Distance Computer was designed to automatically provide accurate information regarding range and height at which a pilot can expect to see runway approach lights. A list of the tests performed during the evaluation of the Computer is given, including test results and recommendations. The equipment is accurate and reliable, and when recommended modifications are completed, the Computer should be suitable for field use. Also presented and discussed are basic equations used in solving visual distance problems, initial approximations to existing conditions for each equation solution, and revised equations together with a need for a computer solution of these equations. Two appendices discuss the computer design and details of the evaluation testing program. (Author)

NAA-SR-6192 $0.50

Atomics International, Canoga Park, Calif.
FORTRAN PROGRAMS FOR CRYSTAL SPACINGS, by G. M. Wolten. Rept. on Contract AT(11-1)-GEN-8. 1 May 61, 44p.

WAPD-TM-255 $0.75

Bettis Atomic Power Lab., Pittsburgh, Pa.
BAFL-1; A PROGRAM FOR THE SOLUTION OF THIN ELASTIC PLATE EQUATIONS ON THE PHILCO-2000 COMPUTER, by J. B. Callaghan, P. H. Jarvis, and A. K. Rigler. Rept. on Contract AT-11-1-GEN-14. Apr 61, 34p.

PB 171 832 $1.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PERCEPTRON APPLICABILITY TO PHOTOINTERPRETATION (PROJECT PICS) by Albert E. Murray. Rept. on Contract Nonr-3161(00), Phase 1. 1 Nov 60, 58p. 5 refs. Rept. no. VE-1446-G-1; AD-252 551.

DESCRIPTORS: *Memory devices, Simulation, Visual perception, Retina, Training, *Data processing systems, Test methods, Learning, Pictures, Aerial photographs, *Photographic intelligence, Analysis, Design, Optical images, Photoelectric effect.

The experiments demonstrate considerable photointerpretation ability inherent in small and simple perceptrons, and design efforts indicate the feasibility of, and a cost estimate for, several advanced models. These design efforts indicate that a versatile Mark II is logically and economically feasible, and show in detail how this may be achieved. After the experiments in image processing were completed, some time was devoted to consideration of special processing techniques and necessary contributions to perceptron development, especially for the automation of photointerpretation tasks. It is believed that the demonstrated strong inherent capabilities of the simple perceptron can be coupled to innovations in design to provide a useful automation, and that the general nature of the necessary innovations is fairly well understood. (Author)

PB 171 830 $2.25

Cornell U., Ithaca, N. Y
COLLECTED TECHNICAL PAPERS, VOLUME I, by H. D. Block, Carl Kesler and others. Rept. no. 1 on Cognitive Systems Research Program, Contract Nonr-401(40). 1 Jan 61, 86p. 63 refs.

DESCRIPTORS: *Scientific reports, *Memory devices, *Data processing systems, Mathematical computers, Simulation, Visual perception, Retina, Learning.

Contents:
Introductory note
The perceptron: A model for brain function, by H. D. Block
Analysis of a four layer series-coupled perceptron by H. D. Block, B. W. Knight, Jr., and F. Rosenblatt
Preliminary experiments on perceptron application to bubble chamber event recognition, by Carl Kesler

PB 155 354 $11.50

Electronic Associates, Inc., Long Branch, N. J.
DEVELOPMENT AND STUDY OF AN INCREMENTAL COMPUTING SYSTEM, by Thomas D. Truitt and Irwin Munt. Final rept. on Contract AF 19(604)5560. Apr 60, 152p. 4 refs. Advanced Study Group ASG rept. no. 3; ERD-TR-50-152; AD-253 047.

DESCRIPTORS: *Computers, *Digital computers, *Analog computers, Design, Applied mathematics, Numerical method and procedures, Functions, Integrators, Simulation.

The results of a study of an incremental computing technique are presented. The logical design of a typical integrator in a completely parallel incremental differential analyzer is described. The outstanding features of this integrator are discussed; they are automatic scaling of incremental variables and multiple precision rate multipliers. The construction of two experimental integrators and the performance of tests and solution of simple equations with these units are reported in detail. (Author)

PB 154 240 $11.00

Laboratory for Electronics, Boston, Mass.
RESEARCH IN FERROMAGNETICS WITH APPLICATIONS TO NEW STORAGE DEVICES, by Harrison W. Fuller and Donald L. Sullivan. Final annual rept. on Contract AF 19(604)5233. Sep 60, 147p. 33 refs. Rept. no. 590-A1. AFCRL-TR-60-198; AD-249 835.

DESCRIPTORS: *Thin films, Films, *Ferromagnetism, Data storage systems, Ferromagnetic materials, Delay lines, Electron optics, Memory devices, Colloids.

Methods of experimentally studying the interaction between magnetic domain walls in adjacent thin films are listed and described. A calculation is made for the interaction energy between two walls in adjacent films using a simplified model for a domain wall consisting of a linear dipole. A calculation of the interaction between one symmetrical and one asymmetrical wall is made and two important special cases are considered. The force function h'f(u) describing the equilibrium

positions of magneto-statically interacting domain walls is calculated and plotted for various cases of unequal wall widths and adjacent film separations. Some aspects of a technique for measuring the external fields of walls in thin films using powder patterns are discussed in light of Kittel's calculation concerning particle collection. Observations of particle collection on walls in a film overcoated with a non-magnetic layer are described. The principle of a wall-stepping device is described that may yield a new class of two-film storage devices. The magnetostatic interaction between a wall in one film and a parallel line imperfection in an adjacent film is considered. The magnetization distribution for striking spiral-wall configurations is deduced and an hypothesis is advanced for the mechanism of their formation. (Author)

PB 155 126 $5.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
INFORMATION PROCESSING, by F. C. Frick and G. P. Dinneen. Quarterly progress rept. 1 Sep-30 Nov 60, on Contract AF 19(604)7400. 15 Dec 60, 55p. 26 refs. AFCCDD-TN-60-1026; AD-252 199.

DESCRIPTORS: *Data processing systems, *Digital computers, *Computers, Learning, Magnetic materials, Psychology, Design, Programming, Memory devices, Circuits, Theory.

Contents:
Digital computers
Data processing
Computer components
Pattern recognition
Analysis
Psychology.
(See also PB 153 361)

PB 155 709 $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
OPERATION OF THE DIODE MATRIX CODER, by William A. Bellmer. Rept. on Contract AF 18(600)1505. 16 Dec 59, 38p. 3 refs. Research rept. R-792-59; PIB-720; AFOSR-TN-60-233; AD-234 297.

DESCRIPTORS: *Digital computers, Diodes, Coding, Computers.

Improvements were made on the preliminary design considerations for a diode-matrix transducer, and a medium size device was constructed. The physical characteristics of this device with associated input producers and output recorder are described to serve as a maintenance reference. Programming methods are provided for each function of the device and examples given. The coder performs all functions reliably except the decoder, which presents problems due to a form of feedback produced by the program. (Author)

PB 150 863 $2.60

Ohio State U. Research Foundation, Columbus.
DESCRIPTION OF A DEVICE FOR COMPUTING STATISTICAL PROPERTIES OF STELLAR SHADOW PATTERNS, by G. Keller, P. E. Barnhart, and A. Angelone. Scientific rept. no. 1 on Contract AF 19(604)1954. Oct 57, 24p. AFCRC-TN-58-225; AD-146 880.

DESCRIPTORS: *Computers, Design, Astronomy, Telescopes, Stars, Brightness, Statistical analysis, Wind direction indicators.

A device for the automatic calculation of the correlation between the intensities at two points in the stellar shadow pattern is described. The intensities are sampled by means of a pair of telescopes so mounted that the separation between them and the orientation of a line joining them can be varied at will while the telescopes simultaneously observe the same star. The computation is carried out by means of the quarter-square method of electronic multiplication. The circuitry designed for this purpose is built into a modular structure to allow convenience of service and a wide latitude of experimentation. A time-delay mechanism to allow time correlation as well as space correlation in the shadow pattern is described. This mechanism is a device for mechanically varying the separation of the play-back heads of a dual-channel tape recorder. A direct-reading pulse counter, used as a wind-direction meter, is also described. (Author)

SCTM-93-61(24) $0.75

Sandia Corp., Albuquerque, N. Mex.
ONE-HUNDRED KILOCYCLE TRANSISTORIZED PROGRAMMABLE ELECTRONIC COUNTER-TIMER, by J. O. Reed. Apr 61, 24p.

MECHANICS

PB 153 292 $4.60

Mellon Inst., Pittsburgh, Pa.
ON THE FOUNDATION OF LINEAR VISCOELASTICITY, by Bernard D. Coleman and Walter Noll (Carnegie Inst. of Tech.). Rept. on Contract AF 49(638)541 and National Science Foundation Grant NSF-G 5250. Nov 60, 42p. 13 refs. AFOSR TN-60-1367; AD-246 689.

DESCRIPTORS: Elasticity, Plasticity, *Fluid mechanics, Theory, Stresses.

The present article reexamines the fundamental hypothesis of linear viscoelasticity in the light of recent advances in non-linear continuum mechanics.

PB 155 294-2 $8.60

Naples U. (Italy).
LAMINAR MIXING IN THE PRESENCE OF AXIAL PRESSURE GRADIENTS, by Luigi G. Napolatino and A. Pozzi. Final rept. part II, on Contract AF 61(052)160. Oct 60, 93p. 10 refs. Instituto di Aeronautica rept. no. 22; AFOSR-TR-60-123, Part 2; AD-252 883.

DESCRIPTORS: *Fluid mechanics, Pressure, *Boundary layer, Axially symmetric flow, Compressible flow, Partial differential equations.

Incompressible, laminar plane mixing is investigated. Questions concerning the validity of a boundary-layer approach and the nature of the third boundary-condition, are settled first. Basic equations are then derived and their solution presented in the form of single quadratures for general pressure gradients and in closed form for special classes of pressure gradients. Results are analysed and discussed with reference to the direct and indirect effects of pressure gradients on the characteristics of the mixing region. The accuracy and limits of validity of the method are evaluated and its extension to the homoenthalpic compressible case worked out. (Author)

PB 155 294-1 $5.60

Naples U. (Italy).
TURBULENT MIXING OF STREAMS OF DIFFERENT GASES, by Luigi G. Napolitano. Final rept. part 1, on Contract AF 61(052)160. July 60, 51p. 16 refs. Istituto di Aeronautica rept. no. 18; AFOSR-TR-60-123, Part 1; AD-252 882.

DESCRIPTORS: *Gas flow, Temperature, *Gases, Turbulence, Mathematical analysis, Turbulent flow.

Exact solutions for constant temperature isovel, turbulent, two dimensional mixing of two infinite streams of different gases are presented. Three solutions were obtained, based on three different phenomenological models for the turbulent transports. The three different phenomenological models assumed are illustrated and discussed first. Pertinent equations are then derived and exact closed form solutions are obtained for each one of the three models considered. An analysis of the characteristics of the mixing region is carried out and the differences in the distributions of the mean properties for the different models is brought forth. The experimental tests to be performed to determine the physically more appropriate model are finally discussed. (Author)

PB 155 273 $4.60

Rensselaer Polytechnic Inst., Troy, N. Y.
STABILITY OF A VORTEX SHEET IN NON-EQUILIBRIUM FLOWS, by K. C. Wang. Rept. on Contract AF 18(600)1591. [1960] 44p. 8 refs. TR AE 6007; AFOSR-48; AD-252 391.

DESCRIPTORS: *Vortices, Stability, Gas flow, Oxygen, Nitrogen, Compressible flow, Partial differential equations, Dynamics, *Dissociation.

The stability of a plane vortex sheet between two uniform streams with respect to small disturbances is examined when the two media are dissociating diatomic gases such as oxygen or nitrogen. For the equilibrium and frozen cases, it is found that the eigenvalue equation is formally identical with that of the conventional case, and the stability is decreased due to the dissociation. For the non-equilibrium case, the eigenvalue equation is a complex one and depends on the wave number of the disturbances, the vortex sheet is shown to be always unstable. Included also is a discussion of the stability of a vortex sheet between two equal but opposite steady streams from the consideration of pressure distribution. (Author)

Aerodynamics and Pneumatics

PB 156 304-1 $5.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF ROTOR RESPONSE TO VIBRATORY AERODYNAMIC INPUTS. PART I. EXPERIMENTAL RESULTS AND CORRELATION WITH THEORY, by Norman D. Ham, Herbert H. Moser, and John Zvara. Rept. for Mar 56-Oct 57 on Aeroelasticity, Vibration and Noise, Contract AF 33(616)3270. Oct 58, 51p. 5 refs, WADC Technical rept. 58-87, Part I; AD-203 389.

This report released for sale to the public 8 June 61.

DESCRIPTORS: *Helicopter rotors, Aerodynamics, *Vibration, Model tests.

The experimentally determined flapping response (1) to harmonic variation in pitch and (2) to vertical shaking of the hub, are compared with theoretical responses calculated for three different two-dimensional, aerodynamic theories. The test data indicates that for low blade pitch angles, the returning wake shed by the rotating blade has a marked effect on the blade response at even integers of the frequency ratio $\nu = \omega/\Omega$ while for high ptich angles the effect of the helical wake is negligible. This agrees with theoretical calculated responses obtained with the aerodynamic theory using a modified lift deficiency function developed by Loewy. The test results indicate that wake interference effects persist for low pitch settings at advance ratios between 0 and 2. Test data obtained with a rotor-rotor type of excitation is a tandem rotor configuration are included. Results indicate that vertical hub shears of the aft rotor are increased. (Author)

PB 156 304-2 $2.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF ROTOR RESPONSE TO VIBRATORY AERODYNAMIC INPUTS. PART II. AN AERODYNAMIC STRIP THEORY FOR ROTARY WINGS EXECUTING SIMPLE HARMONIC MOTIONS NEAR A GROUND PLANE, by Eugene J. Brunelle, Jr. Rept. for Mar 56-Oct 57 on Aeroelasticity, Vibration and Noise, Contract AF 33(616)3270. Oct 58, 30p. 4 refs. WADC Technical rept. 58-87, Part II; AD-203 390.

This report released for sale to the public 8 June 61.

DESCRIPTORS: *Helicopter rotors, Aerodynamics, *Vibration, Model tests.

A theory is presented and closed form expressions are obtained for the pressure distribution, lift, moment, flap-damping and pitch-damping of a rotating wing strip executing simple harmonic motions near a

ground plane. It is shown that the usual fixed-wing expressions for pressure distribution, lift, and moment may be used provided that a modified Theodorsen function is incorporated in the calculation. Furthermore, graphs are presented showing typical trends of the aforementioned quantities in the presence of a ground plane. These trends indicate that when the rotor plane is more than two rotor diameters above the ground plane, the ground effects are completely negligible. (Author) (See also PB 156 304-1)

PB 156 304-3 $8.10

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF ROTOR RESPONSE TO VIBRATORY AERODYNAMIC INPUTS. PART III. THREE-DIMENSIONAL EFFECTS ON UNSTEADY FLOW THROUGH A HELICOPTER ROTOR, by Holt Ashley, Herbert H. Moser, and John Dugundji. Rept. for Mar 56-Oct 57 on Aeroelasticity, Vibration and Noise, Contract AF 33(616)3270. Oct 58, 88p. 16 refs. WADC Technical rept. 58-87, Part III; AD-203 392.

This report released for sale to the public 8 June 61.

DESCRIPTORS: *Helicopter rotors, Aerodynamics, *Vibration, Model tests.

A theory is developed for predicting the spanwise distribution of loads on an oscillating blade. Effects of finite span, unsteady flow and variable relative wind are included. Calculations consisting of a numerical solution of an intergral equation for the bound circulation, followed by evaluation of corrections to the two-dimensional distributions of lift and moment. Applications are made to pitching and flapping oscillations of a typical blade. Three dimensional effects are found to be larger for pitching than flapping apparently a simple correction to the strip theory loads can be devised by multiplying their amplitudes by the ratio of three to two dimensional loads estimated by steady-flow methods. Numerical computations and special functions arising from the theory are discussed. A method is included for introducing the effects of vortex wake shed from the rotor and of forward motion at low tip-speed ratios into the theoretical model. (Author) (See also PB 156 304-2)

PB 155 288 $1.60

Aeronautical Research Inst. of Sweden.
THE INTERFERENCE BETWEEN TWO INTERSECTING PERPENDICULAR TWO-DIMENSIONAL SUPERSONIC FLOW FIELDS, by Marten T. Landahl. Technical note no. 3 on Contract AF 61(052)75. July 59, 20p. 3 refs. FFA rept. AU-II-93:3; AFOSR TN-60-1473; AD-252 804.

DESCRIPTORS:*Wing-body configurations, *Supersonic flow, *Partial differential equations, Gas flow, Theory, Mathematical analysis.

As a simplified model for wing-body interference, the second-order problem for the supersonic flow about two intersecting perpendicular two-dimensional wings is solved. Formulas are given for the second-order interference pressure. By neglecting the effects of velocity gradients, a simplified formula is deduced which is found to give results in good agreement with the more exact theory. At high Mach numbers this formula agrees with the one obtained by B. Beane and M. Landahl, 1959 (Theoretical Investigation of Second-Order Supersonic Interference Effects. FFA AU-II-93:1). (Author)

PB 154 735 $2.60

Arnold Engineering Development Center [Tullahoma Tenn.]
FORCE MEASUREMENTS ON A DATA CAPSULE IN PROXIMITY TO A CARRIER VEHICLE AT SUPERSONIC SPEEDS, by J. Don Gray. Rept. on ARO, Inc. Contract AF 40(600)800. Mar 60, 23p. AEDC-TN-60-46; AD 233 153.

DESCRIPTORS: Stability, Drag, *Supersonics, Blunt bodies, *Cylindrical bodies, Conical bodies, Wake, Ejection, *Space capsules, Supersonic wind tunnels, Tests.

Force measurements on a data capsule model in proximity to a larger carrier vehicle model were made at Mach numbers of 2, 4, and 5 to determine the variation in the forces and pitching moment at different relative locations. Two basic modes of capsule separation from the carrier were investigated, namely, side ejection and base ejection. Large changes in the magnitude of the forces and moment were observed for passage of the capsule through carrier vehicle bow wave and base wake. (Author)

PB 154 221 $8.60

Bell Aerosystems Co., Buffalo, N. Y.
APPROXIMATION METHODS FOR AEROELASTIC SYSTEMS IN HIGH SUPERSONIC FLOW, by Melvin B. Zisfein and Frank J. Frueh. Summary rept. on Contracts AF 49(638)749 and AF 49(638)365. Oct 60, 100p. 8 refs. Rept. no. 7019-918001; AFOSR-TR-60-182; AD-249 805.

DESCRIPTORS: *Supersonic flow, *Stresses, Elasticity, Flutter, Damping, *Aircraft, Dynamics, Numerical methods and procedures

A description is presented of a new dynamic system logic. This new approach to aeroelastic system dynamics is shown not to contradict currently established fact, but rather to be useful in the derivation of new and relatively simple dynamic system approximations. Previously published binary aeroelastic system solutions are summarized as a basis for the physical understanding of the fundamental phenomenon of modal coalescence. The new concepts of V - OMEGA Base curve, High Damping Asymptote, and High Decay Asymptote are reviewed and discussed. The use of these concepts in the formulation of aeroelastic system approximations is introduced. The concepts previously developed in the binary systems study are employed to formulate certain relatively simple approximations to predict the damping and decay properties of ternary aeroelastic systems. New and more sophisticated approximations are developed to relate true system dynamic response to artificial flutter damping in a manner independent of system basic parameters. This is done by using the logic developed for binary systems and the results of both the binary and ternary solutions previously developed. These new approximations are

found to be valid for all of the binary and ternary systems studied to date. They allow the analyst to predict an aeroelastic system's true dynamic response from merely the results of a simple harmonic motion, required structural damping analysis commonly known as an AMC type flutter solution. (Author)

PB 154 222 $9.60

Bell Aerosystems Co. [Buffalo, N. Y.]
DETAILS OF A NEW APPROACH TO SAFE FLIGHT FLUTTER TESTING, by Benjamin B. D'Ewart. Rept. on Contracts AF 49(638)380 and AF 49(638)749. Nov 60, 112p. 4 refs. Rept. no. 7-60-918002; AFOSR TN-60-1476, AD-249 804.

DESCRIPTORS: *Flutter, *Flight testing, *Safety, Test methods, Test equipment.

A basic research program concerned with the synthesis, analysis, and experimental evaluation of a new method of flight flutter testing is described. The method is based on the well known fact that changes in mass distribution can drastically change the vibrational properties of an oscillating aerodynamic surface, and can bring about substantial changes in its flutter speed. A jet device is employed to simulate the force effects of mass and to create thereby an apparent change in the mass distribution of an aerodynamic surface. This apparent mass change can be easily manipulated to make flutter come or go, and can therefore be used as a safe, reliable, flight flutter test device. Equipment and tests are described that utilize mass simulation and develop an analytical method for studying the important features of a nonlinear mass simulating system. Mass simulation was shown to have great promise as a device for improving the safety and speed of flight flutter test programs. (Author)

PB 171 383 $2.25

General Mills, Inc., Minneapolis, Minn.
RESEARCH ON THE EFFECTS OF COLLISIONS OF SMALL PARTICLES WITH BODIES MOVING AT HYPERSONIC SPEED. PART III. EROSION AND HEAT TRANSFER EFFECTS, by G. Whitnah, J. Upton and others. Rept. on Contract AF 33(616)5565. Dec 60, 87p. 11 refs. WADC Technical rept. 58-498, part 3; AD-254 021.

DESCRIPTORS: *Particles, *Heat transfer, *Bodies of revolution, *Aerodynamic heating, Re-entry aerodynamics, Erosion, Ablation, *Hypersonics.

The effects of distributed surface roughness on convective heat transfer were studied experimentally in a blow-down flow channel capable of simulating the aerodynamic characteristics of hypersonic flight. Smooth and roughened copper heat transfer models were utilized. Specially developed heat flux meters, installed in the models gave local heat transfer coefficients. Maximum values for roughened models were 263 percent higher than for smooth models. The effects of surface damage on the ablation process were studied in the blowdown channel, utilizing naphthalene models. The surfaces of these models were either (1) initially smooth, (2) grooved or pitted, or (3) embedded with foreign objects. Potentially deleterious effects on space surfaces, produced by alloy formation with impinging foreign material, was studied experimentally and theoretically. The experimental work was conducted in air, helium and nitrogen atmosphere at temperatures up to 1000°C. The theoretical investigation explored the limitations on the rate of alloy formation. For the cases studied, the time required for significant penetration by alloy formation was found to be long compared to the duration of a ballistic missile re-entry, and of much greater interest in connection with the performance of hypersonic glide vehicles. (Author) (See also PB 161 657)

PB 156 315 $4.60

Institute of Engineering Research, U. of California, Berkeley.
STABILITY OF A VISCOUS COMPRESSIBLE FLOW BETWEEN ROTATING CYLINDERS, by P. L. Chambré. Doctoral thesis. Technical rept. on Fluid Flow and Heat Transfer at Low Pressures and Temperatures, Contract N7onr-295, T. O. 3. 15 June 51, 46p. 26 refs. Rept. no. HE-150-85; Series no. 20, issue no. 78; ATI-195 088.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Compressible flow, Stability, Cylindrical bodies, Bodies of revolution, Heat transfer.

This is a theoretical investigation concerned with the hydrodynamic stability of the curved Couette motion of a viscous compressible flow towards a three dimensional type disturbance. The problem has been investigated according to the method of small oscillations. The origin of the unstable motion is thought to be due to the centrifugal force field which can be created in a rotating cylinder apparatus in which the inner cylinder is rotating and the outer cylinder is at rest. The effects of slippage of the gas at the boundaries and of compressibility due to high speed motion have been investigated. A study of these effects clarifies the three dimensional instability mechanism in a gas flow since previous theoretical investigations have been confined to incompressible fluid flows. (Author)

PB 161 590 $1.00

National Bureau of Standards [Washington, D. C.]
COLLISIONS OF LIQUID DROPS WITH LIQUIDS, by Olive G. Engel. May 61, 33p. 12 refs. Technical note no. 89.

DESCRIPTORS: *Liquids, *Drops, Meteors, Impact shock, *Re-entry aerodynamics, Water impingment, Space flight, Space navigation.

The information available on collisions of liquid drops with liquids is reviewed. Measurements of the depth and diameter of the cavity produced in the target liquid made on G. J. Franz's high-speed motion pictures of collisions of waterdrops with water are reported. The measurement data are considered to be of a preliminary nature. The most important provisional observations drawn from them are: the cavity depth-versus-time curve is a parabola or ellipse tangent to the depth axis at the origin; the depth/diameter ratio of the cavity varies with time elapsed since the collision and has a

value of 0.5 at only two points in time. An equation for maximum cavity depth is derived on the basis of the three assumptions that the impinging drop is spherical, that the cavity is hemispherical, and that the volume of the cavity is proportional to the kinetic energy of the drop. Test of the equation with the measurement data indicates that the assumptions are reasonably good in the low free-fall velocity range. Apparatus that is now being assembled at the National Bureau of Standards to obtain more accurate data and to carry out an exhaustive study of this type of collision is described.

PB 155 293-2 $3.60

Politecnico di Torino (Italy).
ON THE INTERACTION BETWEEN STREAM AND BODY IN A FREE-MOLECULE FLOW. PART II. MOMENTUM EXCHANGES, by Silvio Nocilla. Technical note no. 17 on Contract AF 61(052)208. Sep 60, 32p. 10 refs. AFOSR-TN-60-914, Part 2; AD-252 851.

DESCRIPTORS: *Hypersonic flow, Molecules, Energy, Orbital flight paths, Satellite vehicles, *Superaerodynamics.

Research was conducted on momentum exchanges taking into account the re-emission energy balance on a body surface, and in particular, the calculated re-emission temperature. On a model various calculations of aerodynamic forces are made, from which appears the meaning of the various interaction coefficients introduced in it. The theoretical results are then compared with the known experimental results. The comparison allows us to determine the value of the fundamental parameter which occurs in the model and shows that the real re-emission conditions are far from the diffuse re-emission, in an amount so much greater as greater is the body velocity. (Author) (See also PB 150 346)

PB 155 293-3 $1.60

Politecnico di Torino (Italy).
ON THE INTERACTION BETWEEN STREAM AND BODY IN A FREE-MOLECULE FLOW. PART III. RELATIONS BETWEEN THE INTERACTION COEFFICIENTS AND THE SITTING TIME OF THE MOLECULES ON THE SURFACE, by Silvio Nocilla. Technical note no. 18 on Contract AF 61(052)208. Oct 60, 16p. 5 refs. AFOSR-TN-60-914. Part 3; AD-252 852.

DESCRIPTORS: *Hypersonic flow, Molecules, Energy, Orbital flight paths, Satellite vehicles, *Superaerodynamics.

A general formula for the sitting time of molecules on the surface is deduced. It is then shown that the values of the sitting time through it calculated at various speeds are related by a linear relation to the values of the global accommodation coefficients experimentally obtained for the outward radiating flat plate. (Author)

PB 171 824 $1.75

Polytechnic Inst. of Brooklyn, N. Y.
PRELIMINARY ANALYSIS OF THE CAPABILITIES OF A COMPOSITE SLAB FOR AN ADVANCED HEAT-SINK DESIGN, by Paul A. Libby. Rept. on Experimental Techniques for Materials Research, Contract AF 33(616)5944. Jan 61, 62p. 39 refs. WADD Technical note 59-424, part 2; AD-253 542.

DESCRIPTORS: *Re-entry aerodynamics, *Re-entry vehicles, *Aerodynamic heating, *Beryllium, Beryllium compounds, Oxides, Heat transfer, Numerical analysis.

Presented here are the results of a numerical analysis of the capability of a composite slab of beryllium oxide (BeO) and beryllium (Be) to absorb the heating associated with the re-entry of a high performance ballistic missile. The trajectory considered corresponds to a ballistic factor (W/C_DA) equal to 2000 psf, to a re-entry velocity of 20,000 fps, and to a re-entry angle of 20^o. The numerical results indicate that the maximum permissible heat transfer rates for the trajectory are obtained with a relatively thin slab of beryllium oxide. The addition of beryllium to this slab may be required for structural and thermal shock considerations but does not greatly improve the heat-sink capabilities. The permissible values of the heat transfer parameter are applied to a slender cone with a 20^o half angle and with a spherical cap of 0.25 ft nose radius. It is shown that for laminar flow no heat transfer reduction is required on the cone while for turbulent flow a reduction to 1/2 is required. Various means for achieving heat reduction are discussed. (Author)

PB 154 314 $5.60

Polytechnic Inst. of Brooklyn, N. Y.
A STUDY OF FLOW FIELDS ABOUT SOME TYPICAL BLUNT-NOSED SLENDER BODIES, by Roberto Vaglio-Laurin and Massimo Trella. Rept. on Contract AF 49(638)217. Dec 60, 60p. 17 refs. PIBAL rept. no. 623; AFOSR-2; AD-250 025.

DESCRIPTORS: *Aerodynamic configurations, Distribution, Pressure, Numerical analysis, Shock waves, *Gas flow, *Conical bodies, *Cylindrical bodies, *Spheres, *Blunt bodies.

Complete inviscid flow fields about three model axisymmetric configurations were determined numerically. Configurations (a sphere-cylinder, and two sphere-cone-cylinder combinations of decreasing bluntness) and flight conditions were selected so as to indicate separately effects of nose shape, drag coefficient, flight Mach number, and thermodynamic behavior of the gas. Results are presented for thirteen cases. Particular attention is devoted to interpretation and, when possible, correlation of pressure distributions on, and shock shapes about the cylindrical afterbodies. It was found that (1) the correlation of pressure distributions on bodies having nonspherical noses involves interpretive modifications of the law suggested by blast wave analogy (also shocks about these bodies are not described by parabolae; (2) for all configurations there is substantial influence of gas behavior on shock shape (this, however, can be correlated in terms of the gas conditions along a generally defined streamline; (3) the shock layer can generally be divided into two regions wherein flow properties can either be approximated by simple laws or correlated; and (4) for each configuration knowledge of the complete flow field in one flight condition can be used to estimate features of flows under general flight conditions including those where equilibrium dissociation is encountered. (Author)

PB 156 283 $4.60

Princeton U., N. J.
HEAT TRANSFER FROM AN IONIZED GAS TO A GASEOUS COOLANT, by Jerry Grey. Semi-annual progress rept. no. 2, 1 Aug 59-31 Jan 60, on Contract Nonr-1858(31). 31 July 60, 48p. 11 refs. Aeronautical Engineering rept. no. 487-b; ARPA Order no. 5-58, Task 7; AD-242 928.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Gas ionization, *Heat transfer, Coolants, Gases, Test methods, Test facilities, Measurements, *Jet mixing flow, Laminar boundary layer, Enthalpy, *Plasma jets.

Estimates of approach to equilibrium in the atmospheric-pressure plasmajet indicated only negligible departures, except possibly right at the lip of the nozzle. Successful measurement of local impact pressures (momentum) and local jet composition were made with a single-jacketed sampling probe. Surveys of the plasmajet indicated a large wall velocity defect due to nozzle wall cooling. Tests at different swirl angles indicated that this velocity defect can be countered by a density increase due to swirl, and an optimum swirl angle was selected for the first test series. Calibrations of a full double-jacketed enthalpy probe at low temperatures (up to 3000°F) against shielded thermocouples were made, but flow distortions due to the shield precluded proper correlation. An alternate method for probe calibration was initiated. Operation of current probe models at full torch power has been conducted with no heat-transfer failures. (Author)

PB 156 121 $9.60

Princeton U., N. J.
A MIXING THEORY FOR THE INTERACTION BETWEEN DISSIPATIVE FLOWS AND NEARLY-ISENTROPIC STREAMS, by Luigi Crocco and Lester Lees. Rept. on Contract N6ori-270, T. O. 6. 15 Jan 52, 112p. 22 refs. Aeronautical Engineering rept. no. 187; ATI-134 246.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Jet mixing flow, Theory, *Fluid mechanics, Aerodynamic data, Turbulent boundary layer, Supersonic flow, Pressure, Viscosity.

By means of a simplified theoretical "model", the present paper treats the general class of flow problems characterized by the interaction between a viscous, or dissipative flow near the surface of a solid body, or in its wake, and an "outer" nearly-isentropic stream. For the present the external flow is taken to be a plane, steady, supersonic flow, which makes a small angle with a plane surface, or plane of symmetry, although the methods used can be extended to curved surfaces, to axially-symmetric supersonic flows, and also to subsonic flows. The internal dissipative flow is regarded as quasi-one dimensional, and parallel to the surface on the average, with a properly defined mean velocity and mean temperature. The non-uniformity of the actual velocity distribution is taken into account only approximately, by means of a relation between mean temperature and mean velocity. Mixing, or the transport of momentum from outer stream to dissipative flow, is considered to be the fundamental physical process determining the pressure rise that can be supported by the flow. With the aid of this concept a large number of flow problems are shown to be basically similar, such as boundary layer-shock wave interaction, wake flow behind blunt-based bodies (base pressure problem), flow separation in overexpanded supersonic nozzles, separation on wings and bodies. etc.

PB 155 274 $4.60

Rensselaer Polytechnic Inst., Troy, N. Y.
RECENT ADVANCES IN NONEQUILIBRIUM DISSOCIATING GAS DYNAMICS, by Ting Y. Li. Rept. on Contract AF 18(600)1591. Dec 60, 45p. 46 refs. TR AE 6008; AFOSR 49; AD-252 392.

DESCRIPTORS: *Thermodynamics, *Gas flow, Dynamics, Chemical reactions, Entropy, Partial differential equations, *Dissociation, Superaerodynamics, Enthalpy, *Hypersonic flow.

A review is made of some recent advances in the study of gas dynamic problems including effects of chemical reactions. The discussion is restricted to inviscid flow problems only, neglecting viscosity, heat conductivity and diffusion. Particular attention is directed to recent advances in analyses of nonequilibrium dissociating gas flows. In hypersonic flight regime, high stagnation enthalpies are realized which are sufficient to cause dissociation. When the time to reach equilibrium is comparable with the time it takes for a fluid particle to pass through the flow, then there exists regions of the flow field in which nonequilibrium states are encountered. A brief survey is given of both the linear and the nonlinear methods of treatment of these non-equilibrium flows, including some new developments that have not appeared elsewhere. (Author)

PB 156 341 $6.60

University of Southern California. Engineering Center, Los Angeles.
PRINCIPLE AND APPLICATION OF THE TWO-PHASE WIND TUNNEL SYSTEM, by Raymond L. Chuan and K. Krishnamurty. Interim rept. on Contract Nonr-228(10). Dec 55, 69p. 9 refs. USCEC rept. 42-201; AD-88 259.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Wind tunnels, Design, Thermodynamics.

A thorough analysis of the principle and application of the two-phase wind tunnel system has been made, yielding design information for a proposed facility capable of producing flows at Reynolds numbers between 10^{-1} and 10^{4} (based on 1 cm.) and Mach numbers up to 9 at the higher Reynolds numbers and up to 13 at the lowest Reynolds number. The thermodynamic analysis of the wind tunnel regards it as an iso-

lated system producing entropy due to internal irreversible processes. By proper choice of a temperature the entropy gain of the system is related to the energy required to remove this entropy, which energy then is that required to maintain the flow in the wind tunnel. Instead of using a gas compressor the two-phase system depends on the different vapor pressures of two chambers (each with mixed phases of the working substance) maintained at different temperatures to sustain the flow in the wind tunnel. It is shown that by the use of a helium refrigerator, capable of maintaining temperatures as low as 15° K., flows over the wide ranges of Mach numbers and Reynolds numbers quoted above can be produced with nitrogen, air or other gas mixtures. (Author)

PB 154 346 $10.10

University of Southern California. Engineering Center, Los Angeles.
RESEARCH ON RAREFIED GASDYNAMICS, by Raymond L. Chuan. Technical summary rept. 1 May 56-30 Sep 60, on Contract AF 18(603)95. Nov 60, 124p. 38 refs. USCEC rept. 56-101; AFOSR-22; AD-250 253.

DESCRIPTORS: *Magnetohydrodynamics, *Superaerodynamics, Sattellite vehicles, Mathematical analysis, Motion, Hypersonic flow, Instrumentation, Hypersonic wind tunnels, Heating, Interferometers, Cryogenics, Refrigeration systems.

A low density wind tunnel using a two-phase cycle was developed, as well as a number of associated pressure and density instrumentation devices. Results of Theoretical efforts in solutions of the Boltzmann Equation along with development of associated boundary conditions, and investigations in magnetohydrodynamics (with special emphasis on the motion of artificial satellites) are summarized. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

PB 155 800 $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
THE EFFECT OF A VERY STRONG MAGNETIC CROSS-FIELD ON STEADY MOTION THROUGH A SLIGHTLY CONDUCTING FLUID: THREE-DIMENSIONAL CASE, by G. S. S. Ludford. Scientific rept. no. 4 on Contract AF 19(604)7236. Mar 61, 26p. 8 refs. AFCRL-295; AD-254 574.

DESCRIPTORS: *Fluid flow, *Magnetic fields, Fluids, Conductivity, Mathematical analysis.

PB 155 290 $4.60

Compagnie de Recherches et d'Etudes Aeronautiques (France).
CONTROL OF CIRCULATION AROUND A CIRCULAR CYLINDER, by Jean Brocard. Final technical rept. on Contract AF 61(052)333. 1 Oct 60, 48p. AFOSR-TR-60-181; AD-252 815.

DESCRIPTORS: *Boundary layer control, Drag, Water tanks, Water tunnels. Instrumentation, Wind tunnels, Aerodynamics, Boundary layer, Model basins, *Area suction, Test methods, Cylindrical bodies, Control, Vortices, Lift, France.

Sucking the boundary layer over the circular cylinder produced lift coefficients C(L) from 2.9 to 3.2 with a suction coefficient of 0.17. It was advantageous to suck the boundary layer over a large angular area extending from 150 to 180 deg. with respect to economy of suction energy with the suction peak appearing at the center of the suction area, advantage was gained by distributing the suction symmetrically over the sucked area. Adding a radial flap to the cylinder at the downstream limit of the sucked area improved the lift-drag ratio and slightly increased the maximum lift coefficient. The shape of the suction holes had little influence on lift; an important diminution of transparency improved the maximum C(L) but at the price of an increase in the power required for suction. Results of the tests are compared with classical results obtained with other devices (cylinder with blowing of the boundary layer, Flettner rotor, airfoil using blowing). (See also PB 150 368)

METALLURGY

USBM-U-819 $0.75

Albany Metallurgy Research Center, Ore.
METALLURGICAL PROGRESS REPORT. Quarterly rept. no. 10, 1 Jan-31 Mar 61, on Contract AT(11-1)-599. 23p.

PB 171 834 $1.50

Armour Research Foundation, Chicago, Ill.
PRODUCING MOLYBDENUM ALLOYS BY KROLL REDUCTION, by C. R. Lillie and Charles R. Simcoe. Summary rept. 18 Sep 59-17 Sep 60, on Contract NOas-60-6019-c. 9 Nov 60, 56p. 1 ref. Rept. no. ARF 2188-6; AD-249 111.

DESCRIPTORS: Molybdenum, *Molybdenum alloys, Processing, Reduction, Extrusion, Powder metallurgy, Production.

The work in this program was aimed at demonstrating the feasibility of producing alloyed molybdenum directly through co-reduction of mixed chlorides by the Kroll process. Alloys of molybdenum with titanium and with titanium and carbon have been successfully produced by this method. The product is not a sponge but a powder, since the reaction takes place in the vapor phase and not in the liquid as do most Kroll reductions. Alloying was achieved both in small laboratory-sized units and in a large 40-pound reactor. Extrusion tools, controls, and induction furnace equipment were installed on the Foundation's 1000-ton hydraulic press. Preliminary extrusion trials were made utilizing 70% dense sintered molybdenum billets. The information obtained indicated ranges of billet temperature, compacting pressure, compacting velocity, and extrusion ratio for the direct extrusion of molybdenum alloy powder. (Author)

NAA-SR-6162 $0.50

Atomics International, Canoga Park, Calif.
NITRIDING OF TYPE 304 STAINLESS STEEL IN A SODIUM-NITROGEN SYSTEM, by J. J. Gill and J. C. Bokros. Rept. on Contract AT(11-1)-GEN-8. 30 May 61, 14p.

NAA-SR-5838 $0.75

Atomics International, Canoga Park, Calif.
ON THE MECHANISM OF YIELDING AND FLOW IN IRON, by H. Conrad. Rept. on Contract AT(11-1)-GEN-8. 30 May 61, 39p.

PB 156 345 $4.60

Climax Molybdenum Co. of Michigan, Detroit.
DEVELOPMENT OF TUNGSTEN-BASE ALLOYS, by M. Semchyshen and Robert Q. Barr. Interim rept. no. 3, 1 May 59-15 July 60, on Contract NOa(s) 58-847-c. 15 July 60, 44p. AD-240 639.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Tungsten alloys, *Heat resistant alloys, Casting, Electric arcs, Microstructure, Hardness, Lattices, Oxidation, Cobalt alloys, Hafnium alloys, Tantalum alloys, Vanadium alloys, Zirconium alloys, Melting.

Seven tungsten-base alloys were arc-cast. The alloy additions were added to the consumable tungsten electrode at increasing rates, producing compositionally graded ingots. By this technique, tungsten-base binary alloy ingots with cobalt, hafnium, tantalum, vanadium, or zirconium were produced. Attempts to arc-cast ingots of tungsten with nickel or silicon failed due to the high vapor pressure of these alloying elements at the melting point of tungsten. The tungsten-base binary alloys were evaluated with respect to macrostructure, microstructure, hardness at room temperature and at 1600 F, lattice parameter, and oxidation rate at 2000 F as a function of alloy addition. (Author)

PB 155 227 $1.60

Columbia U., New York.
MICROCRACKS IN MILD STEEL, by D. N. Beshers, M. Ohring, and W. F. Schnabel. Rept. on Contract AF 49(638)408. June 60, 16p. 8 refs. AFOSR-TN-60-977; AD-247 554.

DESCRIPTORS: *Steel, *Deformation, *Fracture (Mechanics), Liquefied gases, Nitrogen, Temperature, Low temperature research, Iron, Alloys, Growth, Microstructure.

The origin and nature of microcracks in various iron compositions and steels were investigated. Polycrystalline samples of pure iron and mild steel in the form of polished sheet tensile specimens about 0.040 in. thick were pulled at liquid N temperatures, etched with nital to bring out the grain boundaries, and then electroetched. The specimens were examined under a microscope for cracks which were contained entirely within 1 grain. Most of the cracks were observed in the 1020 steel specimens; some were observed in 1010 steel but none were seen in Armco iron specimens. All but 4 of the 19 single grain cracks observed supported the hypothesis that the first crack is a (100) cleavage crack. The growth of microcracks appeared to be the result of some type of imperfection, such as a cavity dislocation which can gnaw when some condition involving the applied stress is fulfilled, but then becomes a microcrack and may be stopped. Studies indicated that microcracks tend to lie perpendicular to the tensile and form in, and propagate through grains which are larger than average. Microcrack propagation into a new grain is more likely when the new grain is favorable oriented; the microcracks can be stopped short of grain boundaries.

PB 171 851 $2.25

Lockheed Aircraft Corp., Sunnyvale, Calif.
BERYLLIUM: A SURVEY OF THE LITERATURE, by Kenneth D. Carroll. Special bibliography. Dec 60, 97p. 229 refs. LMSD-288190, Suppl. no. 3; AD-253 284.

DESCRIPTORS: *Beryllium, *Beryllium alloys, *Beryllium compounds, *Bibliography, Powder metallurgy, Phase studies, Reactor fuels, Heat treatment, Crystal structure, Casting, Corrosion, Aging, Thermodynamics, Purification, Chemical analysis, Spectrographic analysis, Welding, Toxicity.

The bibliography covers publications released during the final quarter of 1960. Citations are arranged alphabetically by author under broad subject headings of: Alloys; Analysis; Applications; Compounds; Bibliography; Fabrication Techniques; Hazards; Joining; Oxides; Powder Metallurgy and Casting; Processing; Properties; and Miscellaneous. References to the use of beryllium in fuels, nuclear reactor applications, effects of radiation, and Cu-Be alloys have been omitted.

PB 154 732 $1.60

Michigan U. Coll. of Engineering, Ann Arbor.
CHEMICAL SINTERING OF BERTHOLLIDE COMPOUNDS, by G. Parravano. Technical note on Contract AF 49(638)493. Jan 61, 20p. 6 refs. 2832-12-T; AFOSR-TN-60-109.

DESCRIPTORS: *Sintering, *Alloys, Zinc compounds, Vanadium compounds, Oxides, Chemical reactions, Thermodynamics, Diffusion, Solids.

The role of solid-state reactions in the sintering of berthollide compounds is examined. Under some conditions, the free energy change of the chemical transformation is the determining factor for the welding together of particulate nonstoichiometric solids. A diffusional transfer of matter in the solid controls the chemical reaction and, consequently, sintering. Mathematical expressions for diffusion and sintering in the simple case of two spherical particles are presented and the results are compared with experimental data on the sintering of zinc oxide microspheres. Equations for the shrinkage of pores as a result of a chemical reaction are also presented. (Author)

PB 155 457 $3.60

Northwestern Technological Inst., Evanston, Ill.
PRECIPITATE HARDENING IN AN ALUMINIUM-COPPER ALLOY, by J. G. Byrne, M. E. Fine, and A. Kelly. Rept. on Contract AF 49(638)524. Feb 61, 34p. 42 refs. AFOSR-120; AD-253 629.

DESCRIPTORS: *Aluminum alloys, *Copper alloys, Hardening, Shear stresses, Tensile properties, Stresses, Deformation, Solids, Solutions, Lattices, Electron transitions, Atomic structure, *Dispersion hardening, Phase studies, Plasticity.

In Al-1.7 at.% Cu the critical resolved shear stresses, tension stress-strain curves, and the dependence of the flow stress on strain rate were determined from 4.2 to 373°K.

ORNL-3028 $1.25

Oak Ridge National Lab., Tenn.
FAST-FLUX MEASUREMENTS IN THE ORR CORE, by P. Dragoumis, J. R. Weir, and G. W. Leddicotte. Rept. on Contract W-7405-eng-26. 45p.

Y-1343 $1.00

Union Carbide Nuclear Co., Oak Ridge, Tenn.
PRODUCTION OF TUNGSTEN ROCKET NOZZLE INSERTS, by A. C. Neeley. Rept. on Contract W-7405-eng-26. 12 Dec 60, 40p.

Structural Metallurgy and Corrosion

ANL-6207 $0.75

Argonne National Lab., Ill.
CORROSION OF ALUMINUM AND ITS ALLOYS IN SUPERHEATED STEAM, by J. E. Draley, W. E. Ruther, and S. Greenberg. Rept. on Contract W-31-109-eng-38. Apr 61, 31p.

WAPD-TM-219 $0.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
EFFECT OF SURFACE TREATMENT ON THE CORROSION RESISTANCE OF ZIRCALOY-2, by D. B. Scott. Rept. on Contract AT-11-1-GEN-14. Apr 61, 20p.

PB 154 691 $3.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
CORROSION STUDIES ASSOCIATED WITH AN AIR BLAST CLOSURE UNIT, by C. V. Brouillette. 30 July 59, 37p. Technical note N-360; AD-250 625L.

DESCRIPTORS: Naval equipment, Alloys, Springs, Metals, *Corrosion, Test methods, Tests, Air blast.

The efficient operation of a mechanical device is very dependent upon the ease of movement of its various working parts. Eleven months exposure of an air blast closure unit, fabricated from a combination of several different metals and alloys, resulted in the formation of a sufficient quantity of corrosion products to render the closure unit of doubtful operational value. It is recommended that neoprene rubber gasketing be used throughout; that the louver door frame and support brackets be fabricated from 6061 Aluminum Alloy; that all pins be cadmium plated and coated with an inhibited soft grease such as AN-C-124a, AM3 Type II; and that all springs be heavily coated with the inhibited soft grease. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

PB 154 919 $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
ABSORPTION ANALYSIS APPLIED TO NEUTRONS IN A THERMAL COLUMN, by L. F. Lowe and E. A. Burke. Nov 60, 24p. 2 refs. AFCRL-TR-60-355; AD-251 549.

DESCRIPTORS: *Thermal column, Energy, Neutron spectrum, Neutron beams, *Neutron absorption, Absorption, Test methods.

The energy spectrum of diffuse neutrons in the thermal column of the MIT reactor was determined by analyzing transmission data. The results are compared to a Maxwellian distribution and to an experiment done on collimated thermal neutrons. (Author)

WAPD-TM-280 $0.75

Bettis Atomic Power Lab., Pittsburgh, Pa.
ISOTOPIC ANALYSIS OF IRRADIATED NATURAL URANIUM DIOXIDE FUEL RODS FROM PWR CORE 1-PRELIMINARY RESULTS, by C. D. Sphar, J. H. Leonard, and P. S. Lacy. Rept. on Contract AT-11-1-GEN-14. Feb 61, 32p.

BNL-632(AS-14) $2.75

Brookhaven National Lab., Upton, N. Y.
ANNUAL REPORT JULY 1, 1960, on Contract AT-30-2-GEN-16. Apr 61, 195p.

PB 155 422 $3.60

Genoa U. (Italy).
IONIZATION MEASUREMENTS IN GAS BUBBLE CHAMBER AND STUDY OF NUCLEATION PROCESSES AND GROWTH DYNAMICS OF GAS-BUBBLE IN STRONGLY OVERSATURATED GAS-LIQUID SOLUTIONS, by P. E. Argan, V. Bisi (Torino U.) G. Bendiscioli (Pavia U.) and others. Final technical rept. for June 59-July 60 on Contract AF 61(052)285. 14 Nov 60, 40p. 5 refs. AFOSR-TR-60-184; AD-253 268.

DESCRIPTORS: *Electrons, *Ionization, Bubbles, Gases, Measurement, Energy, *Ionization chambers.

Photographic material was obtained by exposing a one litre working volume Gas Bubble Chamber to the gamma ray beam ov the 31 MeV Betatron. Measurements and calculations on energy loss of fast electrons were carried out. The design and construction of a 15 litre working volume Gas Bubble Chamber are considered. This Chamber will be used with the 1100 MeV Electronsynchrotron to make clear some points regarding the energy loss of fast particles in sensitive gasliquid mixtures of various natures. The results obtained during the experimental study of the characteristics of some sensitive gas-liquid mixtures having peculiar properties are presented, essentially with regard to their stopping power and their efficiency in the conversion of high energy gamma rays. (Author)

UCRL-9497 $1.75

Lawrence Radiation Lab., U. of California, Berkeley.
NUCLEON AND NUCLEAR CROSS SECTIONS FOR POSITIVE PIONS AND PROTONS ABOVE 1.4 Bev/c, by M. J. Longo. Report on Contract W-7405-eng-48. Feb 61, 76p.

NAS-NS-3031 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE RADIOCHEMISTRY OF THE TRANSCURIUM ELEMENTS, by G. H. Higgins. 25 Oct 60, 39p.

MCW-1464 $1.50

Mallinckrodt Chemical Works, Weldon Spring, Mo.
PROCESS DEVELOPMENT. Quarterly progress rept. Jan-Mar 61, on Contract W-14-108-eng-8. 1 May 61, 63p.

MLM-1104 $0.50

Mound Lab., Miamisburg, Ohio.
ISOTOPE SEPARATION BY THERMAL DIFFUSION: SHAPE FACTORS FOR THE EXTREME CYLINDRICAL CASE, by M. L. Curtis, V. Wurstmer, and G. R. Grove. Rept. on Contract AT-33-1-GEN-53. 15 July 60, 20p.

PB 155 419 $1.60

Nobel Inst. of Physics, Stockholm (Sweden).
ALPHA ACTIVITIES AND MASS NUMBER ASSIGNMENTS OF LIGHT ASTATINE ISOTOPES PRODUCED BY HEAVY ION REACTIONS, by W. Forsling, T. Alvager and others. Technical note no. 3 on Contract AF 61(052)118. 15 Nov 60, 20p. 28 refs. AFOSR-112; AD-253 299.

DESCRIPTORS: Gold, *Ion bombardment, Carbon, Neon, Cyclotrons, *Astatine, Radioactive isotopes, Neutrons, Alpha particles.

In order to study neutron-deficient astatine isotopes, gold was bombarded by carbon and neon ions in the Stockholm 225-cm cyclotron. Chemical isolations and mass separations were made and the alpha activities found were determined with respect to half-lives and energies by use of ion chamber technique. The isotopes 202At, 203At, 204At, 205At, 206At and 207At were studied. (Author)

ORNL-3083 $2.00

Oak Ridge National Lab., Tenn.
ELECTRONUCLEAR RESEARCH DIVISION. Annual progress rept. ending 16 Jan 61, on Contract W-7405-eng-26. 80p.

NAS-NS-3030 $0.50

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF SELENIUM, by G. W. Leddicotte. Apr 61, 42p.

WASH-1031 $2.00

Oak Ridge National Lab., Tenn.
REPORTS TO THE AEC NUCLEAR CROSS SECTIONS ADVISORY GROUP, LOS ALAMOS SCIENTIFIC LABORATORY, FEBRUARY 20-21, 1961. 84p.

DP-549 $0.50

Savannah River Lab., Aiken, S. C.
THE EFFECT OF GAMMA RADIATION ON ION EXCHANGE RESINS, by L. L. Smith and H. J Groh. Rept. on Contract AT(07-2)-1. Feb 61, 14p.

Instruments and Installations

WT-1194 $2.00

Office of Civil and Defense Mobilization, Wash., D.C.
DAMAGE TO CONVENTIONAL AND SPECIAL TYPES OF RESIDENCES EXPOSED TO NUCLEAR EFFECTS, by P. A. Randall. Operation Teapot. 12 Apr 61, 80p. In cooperation with Federal Housing Administration, Washington, D. C. and Housing and Home Finance Agency, Washington, D. C.

SC-4556(RR) $2.25

Sandia Corp., Albuquerque, N. Mex.
DEVELOPMENT OF DESIGN CRITERIA FOR RELAYS. Interim rept. 1 Nov-31 Dec 60. Feb 61, 67p.

K-1470 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
IS ALL NUCLEAR RADIATION HARMFUL? by H. F. Henry. Rept. on Contract W-7405-eng-26. 2 May 61, 25p.

Nuclear Engineering and Power

ANL-6286 $1.75

Argonne National Lab., Ill.
CONCEPTUAL DESIGN OF A COUPLED BREEDING SUPERHEATING REACTOR, CBSR, by R. Avery, W. V. Dewey and others. Rept. on Contract W-30-109-eng-38. Mar 61, 69p.

ANL-6306 $0.75

Argonne National Lab., Ill.
PHYSICS ANALYSIS OF PROPOSALS FOR EBWR CORE 2, by R. Avery and C. N. Kelber. Rept. on Contract W-31-109-eng-38. Apr 61, 35p.

ANL-6355 $1.75

Argonne National Lab., Ill.
REACTOR DEVELOPMENT PROGRAM. Progress rept Apr 61, on Contract W-31-109-eng-38. 15 May 61, 75p.

TID-11403 $0.75

Atomic Energy Commission. Div. of International Affairs, Washington, D. C.
U. S.-EURATOM RESEARCH PROGRAM - SUMMARIES. Apr 61, 34p.

TID-7600 $2.00

Atomic Energy Commission. Div. of Reactor Development, Washington, D. C.
PROCEEDINGS OF THE SYMPOSIUM ON NON-DESTRUCTIVE TESTING TRENDS IN THE AEC REACTOR PROGRAM. Held at Atomic Energy Commission Headquarters Building Germantown, Maryland, 20 May 60. Mar 61, 89p.

NAA-SR-5190 $1.25

Atomics International, Canoga Park, Calif.
A COMPARISON OF TYPICAL FUEL CYCLE COSTS FOR THERMAL AND NONTHERMAL SODIUM-COOLED REACTORS, by K. W. Foster. Rept. on Contract AT(11-1)-GEN-8. 30 May 61, 50p.

BMI-1504(Del.) $2.50

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING FEBRUARY, 1961, by R. W. Dayton and C. R. Tipton, Jr. Rept. on Contract W-7405-eng-92. 1 Mar 61, 103p.

BMI-1509(Del.) $2.25

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING MARCH, 1961, by R. W. Dayton and C. R. Tipton, Jr. Rept. on Contract W-7405-eng-92. 1 Apr 61, 99p.

BNL-646(S-56) $1.75

Brookhaven National Lab., Upton, N. Y.
NUCLEAR ENGINEERING DEPARTMENT. Progress rept. 1 May-31 Aug 60. May 61, 75p.

GAT-388 $0.50

Goodyear Atomic Corp., Portsmouth, Ohio.
DEVELOPMENT AND PERFORMANCE OF THE PROTOTYPE SEAL FOR THE POWER RECOVERY TURBINE, by W. M. Heher. Rept. on Contract AT(33-2)-1. 12 May 61, 17p.

HW-67937 $2.75

Hanford Atomic Products Operation, Richland, Wash.
DECONTAMINATION STUDIES FOR HAPO WATER-COOLED REACTOR SYSTEM: Progress rept. 1 Jan-1 Sep 60, on Contract AT(45-1)-1350. 27 Dec 60, 170p.

HW-67000 $2.00

Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM RECYCLE PROGRAM, ed. by J. M. Atwood and W. A. Snyder. Annual rept. fiscal year 1960 on Contract AT(45-1)-1350. 15 Aug 60, 89p.

LAMS-2537 $1.25

Los Alamos Scientific Lab., N. Mex.
CORRELATIONS OF EXPERIMENTAL AND THEORETICAL CRITICAL DATA. Comparative Reliability, Safety Factors for Criticality Control, by H. C. Paxton. Rept. on Contract W-7405-eng-36. Mar 61, 54p.

ORNL-3077 $2.25

Oak Ridge National Lab., Tenn.
FABRICATION DEVELOPMENT OF UO_2-STAINLESS STEEL COMPOSITE FUEL PLATES FOR CORE B OF THE ENRICO FERMI FAST BREEDER REACTOR, by J. H. Cherubini, R. J. Beaver, and C. F. Leitten, Jr. Rept. on Contract W-7405-eng-26. 96p.

IDO-16658 $1.25

Phillips Petroleum Co., Idaho Falls.
MTR-ETR TECHNICAL BRANCHES, Quarterly rept. 1 July-30 Sep 60, on Contract AT(10-1)-205. 15 Feb 61, 53p.

IDO-16617 $0.75

Phillips Petroleum Co., Idaho Falls.
SPERT PROJECT, ed. by T. R. Wilson. Quarterly technical rept. 1 Jan-31 Mar 60, on Contract AT(10-1)-205. 31 Mar 61, 31p.

PB 156 282 $10.50

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
SURVEY OF IRRADIATION FACILITIES, by J. F. Kircher. [Rept. on Contract AF 33(616)6564,

continuation of Contract AF 33(616)5171]. 30 Apr 60, 136p. 61 refs. REIC rept. no. 11, supersedes rept. no. 7 and its addendum; AD-237 794.

This report released for sale to the public 13 June 61

DESCRIPTORS: *Research reactors, *Gamma rays, *Fast neutrons, Sources, *Test reactors.

A survey is presented of irradiation facilities generally available to the Air Force and its contractors. Reactor facilities and gamma facilities were included in this survey. Wherever possible, the information was tabulated. (Author)

DP-568 $0.50

Savannah River Lab., Aiken, S. C.
HYDROGEN DETECTOR FOR MONITORING URANIUM CLADDING FAILURES, by R. L. Hooker. Rept. on Contract AT(07-2)-1. Mar 61, 11p.

DP-563 $0.50

Savannah River Lab., Aiken, S. C.
A REMOTELY OPERABLE CUTTER FOR IRRADIATED METALLIC-URANIUM TUBES, by F. C. Locke, Jr. Rept. on Contract AT(07-2)-1. Mar 61, 8p.

KY-364 $2.00

Union Carbide Nuclear Co., Paducah, Ky.
PROBLEMS, TESTS AND INVESTIGATIONS OF MATERIAL OF CONSTRUCTION FOR THE PADUCAH GASEOUS DIFFUSION PLANT COOLING TOWERS, by J. R. DeMonbrun and J. R. Largey. Rept. on Contract W-7405-eng-26. 24 Mar 61, 92p.

Nuclear Reactions

UCRL-6277 $1.25

Lawrence Radiation Lab., U. of California, Livermore.
ELASTIC SCATTERING OF 24-MEV NEUTRONS BY Al, Fe, Sn, AND Bi, by T. P. Stuart. Rept. on Contract W-7405-eng-48. Jan 61, 50p.

UCRL-9548 $1.50

Lawrence Radiation Lab., U. of California, Berkeley
π^+-p TOTAL CROSS SECTIONS IN THE RANGE 450 Mev TO 1650 Mev, by T. J. Devlin. Rept. on Contract W-7405-eng-48. 6 Mar 61, 59p.

Radioactivity

PB 156 301 $1.60

Industrial Lab., Mare Island Naval Shipyard, Vallejo, Calif.
DEVELOPMENT OF A PROCEDURE FOR ESTIMATING THE AMOUNT OF RADIOACTIVITY IN BRACKISH WATER, by Paul T. Wagner. [5 Mar 58] 19p. 6 refs. Rept. no. 6051-57; AD-202 977.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Water, San Francisco Bay, *Radioactivity, Determination.

A method for determining the radio-concentration of brackish waters, containing a low-level of radioactivity, was developed. The value for potassium, after taking into account the low concentration of other radioisotopes, agreed with the calculated potassium activity based on the amount of potassium in the water. The radio-concentration of the Mare Island Channel water was found to be 2.6×10^{-7} microcuries per milliliter with a probable error of about 0.2×10^{-7}. The non-potassium activity was estimated to be 0.2×10^{-7} microcuries per milliliter. In counting, the total number of counts was distributed between sample and background so as to give a minimum standard deviation. The expected randomicity of the counts was confirmed by chi-square tests, which also showed that the mean absolute background was essentially constant for the various counting periods. (Author)

LAMS-2499 $0.50

Los Alamos Scientific Lab., N. Mex.
BETA-GAMMA RADIOACTIVITY IN ENVIRONMENTAL AIR AT LOS ALAMOS, NEW MEXICO FOR 1960, by W. R. Kennedy. Rept. on Contract W-7405-eng-36. 30 Jan 61, 22p.

PB 171 821 $7.00

Naval Radiological Defense Lab., San Francisco, Calif.
SHIELDING SYMPOSIUM PROCEEDINGS, 31 OCTOBER-1 NOVEMBER 1960. [1960] 507p. 132 refs. Reviews and Lectures no. 110.

DESCRIPTORS: *Shielding, *Radioactivity, *Radiological warfare, Countermeasures, Conferences, Structures, Design, Materials, Protective shelters, Radioactive fall-out.

Waste Disposal

IDO-14544 $0.50

Phillips Petroleum Co., Idaho Falls.
CESIUM REMOVAL FROM ACIDIC RADIOACTIVE WASTE SOLUTIONS, by M. W. Wilding. Rept. on Contract AT(10-1)-205. 14 Apr 61, 25p.

IDO-14539 $0.75

Phillips Petroleum Co., Idaho Falls.
PILOT PLANT STUDIES WITH A SIX-INCH DIAMETER FLUIDIZED BED CALCINER, by D. R. Evans. Rept. on Contract AT(10-1)-205. 20 Apr 61, 30p.

PHYSICS

ANL-6345 $0.50

Argonne National Lab., Ill.
CONVERGENCE OF TRANSPORT SOLUTIONS FOR THIN SLAB CELLS, by D. Meneghetti. Rept. on Contract W-31-109-eng-38. Apr 61, 24p.

PB 154 347 $4.60

Federal Scientific Corp., New York.
A PRELIMINARY STUDY OF SPECTRUM ANALYSIS RELATED TO THE PROBLEM OF AUTOMATIC SPEECH RECOGNITION SYSTEMS. Final rept. on Contract AF 30(602)2333. 30 Dec 60, 46p. 7 refs. FSC-F/114; RADC TR-61-5; AD-251 483.

DESCRIPTORS: *Speech, Analysis, Coding, Intelligibility, Simulation.

The feasibility is explored of employing a spectrum analyzer of the SIMORAMIC type in a comprehensive analysis program to obtain the basic data required for the design of a practical automatic speech recognition system. Essential information-bearing parameters of speech may be presented in the form of a code. The automatic speech recognition system will operate in conjunction with a high-speed computer in real time. The ultimate applications of such a system would include: (1) the automatic translation of speech into another form of intelligence, such as its conversion into typed material; (2) program adaptation of computers as a result of vocal instructions; and (3) the use of "voice" inputs to computers for such purposes as editing, etc. (Author)

UCRL-9509 $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
ION DENSITY MEASUREMENTS IN A DECAYING HYDROGEN PLASMA, by W. S. Cooper, III, A. W DeSilva, and J. M. Wilcox. Rept. on Contract W-7405-eng-48. 1 Mar 61, 29p.

UCRL-9588 $2.25

Lawrence Radiation Lab., U. of California, Berkeley.
THE POSITIVE COLUMN IN A LONGITUDINAL MAGNETIC FIELD, by G. A. Paulikas. Rept. on Contract W-7405-eng-48. 27 Feb 61, 98p.

LA-2500 $0.50

Los Alamos Scientific Lab., N. Mex.
AN AUTOMATIC RECORDING LOW-TEMPERATURE DILATOMETER, by K. A. Gschneidner, Jr., R. R. McDonald, and R. O. Elliott. Rept. on Contract W-7405-eng-36. Dec 60, 18p.

ORNL-3085 $2.50

Oak Ridge National Lab., Tenn.
PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING FEBRUARY 10, 1961. Rept. on Contract W-7405-eng-26. 120p.

SCR-299 $0.75

Sandia Corp., Albuquerque, N. Mex.
AN INDEX OF TABLES AND CHARTS FOR USE IN GAS DYNAMIC STUDIES, by D. E. Randall. Bibliography. Mar 61, 32p.

Electricity and Magnetism

PB 152 382 $2.60

California U., Berkeley.
NUCLEAR RELAXATION AND DYNAMIC POLARIZATION IN SOLIDS, by P. L. Scott. Technical rept. no. 3 on Contract Nonr-222(61). 1 June 60, 28p. 5 refs.

DESCRIPTORS: Solids, *Nuclei, Nuclear spins, *Polarization, *Nuclear magnetic dipole moments, Paramagnetic resonance, *Relaxation time, Mathematical analysis.

This report concerns theoretical mechanisms for relaxation and dynamic polarization of nucleii in a solid containing a small percentage of paramagnetic impurities. Spatial diffusion of nuclear polarization is taken into account, and its effects on both the transient and steady state behavior of the average nuclear polarization are worked out in detail for a simple model. (Author)

PB 155 490 $5.60

Georgetown Coll. Observatory, Washington, D. C.
A SURVEY OF GEOMAGNETISM, by Francis Glover and Francis J. Heyden. Rept. on Contract AF 19(604)7203. Dec 60, 59p. 131 refs. Georgetown Observatory Monograph no. 16; AFCRL-TN-60-664; AD-253 574.

DESCRIPTORS: *Terrestrial magnetism, Sun, *Magnetic fields, *Astrophysics, *Geophysics, Astronomy, Van Allen radiation belt, Stars, Galaxies, Geodesics, Satellite vehicles, Earth.

Contents:
General description of the main field at the earth's surface
Secular deviations of the main field
Transient phenomena
Magnetic instrumentation
Indices of magnetic activity
The magnetosphere
Morphology and theory of Sq and L variations
Morphology and theory of magnetic disturbances
Solar, Stellar, and Galactic magnetic fields.

PB 155 663 $8.60

Maryland U., College Park.
GEOMAGNETIC FIELD PERTURBATIONS DUE TO TRAPPED PARTICLES, by John R. Apel. Master's thesis. Rept. on Contract AF 19(604)3861. Apr 61, 91p. 46 refs. AFCRL-420; AD-254 337.

DESCRIPTORS: Earth, *Magnetic fields, Particles, Motion, Perturbation theory, Mathematical analysis, Magnetic effects, Terrestrial magnetism.

Particles trapped in a magnetic dipole field cause two distinct magnetic effects: (1) the gyration about the lines of force gives rise to a magnetization current which produces a positive perturbation interior and exterior to the trapped particle region; (2) the particles drift in azimuth and the resultant ring current decreases the driving field interior to the trapping region and increases it to the exterior. At the dipole center this effect is opposite to and three times as large as the diamagnetic effect (1). Explicit expressions are derived for the current and the perturbed field which would be observed as one progressed radially outward in the equatorial plane through the outer radiation belt.

PB 156 316 $1.10

Massachusetts Inst. of Tech., Cambridge.
LIQUID NITROGEN-COOLED MAGNET, by S. C. Collins. Technical rept. no. 1 on Contract N5ori-78, T. O. 23. 15 July 50, 8p. 2 refs. ATI-155 259.

This report released for sale to the public 16 June 61.

DESCRIPTORS: *Magnets, Design, Liquid cooled, Nitrogen, Liquefied gases.

Electronics

PB 155 592 $2.60

Bartol Research Foundation, Franklin Inst., Swarthmore, Pa.
RESEARCH AND INVESTIGATION OF CATHODE EMISSIVE MATERIALS, by W. E. Danforth. Scientific rept. no. 11 on Contract AF 19(604)3904. 15 Jan 61, 24p. 4 refs. AFCRL-47; AD-253 988.

DESCRIPTORS: *Cathodes (Electron tubes), Materials, *Thermionic emission, Tungsten, Atoms, Single crystals, Growth, Evaporation, Theory, Adsorption.

Data relative to emission-vs-coverage of an 832 tungsten plane has been analyzed with respect to a ball model of this plane with tungsten and thorium atoms in the proper size ratio. Difficulties encountered in growing large single grains in tungsten ribbons were found to be characteristic of the particular batch. Work has been in progress relative to the theory of monolayer evaporation. (See also PB 153 907)

PB 155 471 $6.60

Electron Tube Research Lab., U. of Minnesota, Minneapolis.
STUDIES ON BASE NICKELS FOR OXIDE-COATED CATHODES, by W. G. Shepherd and D. E. Anderson. Scientific rept. no. 10, 15 July-15 Oct 60, on Contract AF 19(604)3890. [1960] 66p. 10 refs. AFCRL-2; AD-253 675.

DESCRIPTORS: *Oxide cathodes, *Coatings, *Nickel alloys, *Cathodes (Electron tubes), Materials, *Thermionic emission, Thin films.

Studies of the relationship between chemical reduction and thermionic activity of an oxide cathode continued. A method is described whereby the degree of diffusion throttling produced in a given case can be determined by a resistance measurement, using the analoque between steady-state diffusion processes and electrodynamic processes. Further studies utilizing the application and removal of carbon from the back face of the cathode base, in a separate vacuum enclosure, are also described. Cathodes, based on 0.2% and 0.08% Al-Ni alloys, have now been operated at 1093°K for about 15,000 hours. Results are reported on the activation of oxide cathodes through exposure to heated Ti anodes. Hydrogen evolved from the Ti anodes causes an enhancement of emission from an oxide cathode which was exposed to the anode. The technique used to prepare BaO thin film cathodes is described. Photoelectron yield measurements on a BaO coating produced by conversion of $BaCO_3$ have been inaugurated. Preliminary results show a rapid enhancement of the photoelectron yield as a consequence of the monochromatic light incident on the coating. Results are presented on the deactivation of an oxide-coated cathode by exposure to Cl dissociated from $BaCl_2$ by electron bombardment. (Author) (See also PB 154 450)

PB 155 539 $1.60

Rome U. (Italy).
MODES IN RECTANGULAR GUIDES LOADED WITH A TRANSVERSELY MAGNETIZED SLAB OF FERRITE AWAY FROM THE SIDE WALLS, by Giorgio Barzilai and Giorgio Gerosa. Technical note no. 2 on Contract AF 61(052)101. 30 July 60, 17p. 3 refs. AFCRL-138; AD-253 077.

DESCRIPTORS: *Waveguides, Electromagnetic waves, Microwaves, Wave transmission, Mathematical analysis, Ferromagnetic materials, *Ferrites.

The characteristic equation describing the general modal spectrum for a rectangular guide partially filled with a slab of ferrite transversely magnetized and situated away from the side walls is derived. This equation is numerically solved for particular cases and for modes of zero and first order with respect to the dependence along the direction of the d.c. magnetic field. Some experiments to verify the theoretical results are presented and show good agreement with the theory. (Author)

Molecular Physics and Spectroscopy

PB 155 625 $1.60

Indiana U., Bloomington.
HIGH RESOLUTION KINETIC SPECTROSCOPY BY A MULTIPLE FLASH METHOD, by Henry H. Kramer, Maurice H. Hanes, and Edward J. Bair. Rept. on Contract AF 18(603)93. 28 Feb 61, 15p. 11 refs. AFOSR TN-60-1426; AD-253 824.

DESCRIPTORS: *Xenon lamps, *Spectrophotometers, *Stroboscopes, Absorption, Measurement, Signals, Photolysis, Free radicals, Spectrographic analysis, Recombination reactions, Light.

Experiments are described in which double beam absorption measurements are made at high spectral resolution (better than 0.05Å in the visible and near ultraviolet) at an accurate sequence of time intervals as

short as 200 μsec. This is accomplished with a high resolution monochromator and dual photomultiplier detector using a stroboscopic xenon flash source. Signals representing the absorption ratios are recorded on magnetic tape and read out with a digital integrator. A quantitative test of this procedure was made by observing the iodine recombination reaction following flash photolysis. The accuracy of the results compares favorably with previous measurements which have used spectral band widths a thousand times broader. The use of this method for measuring rates of free radical reactions is described using observations of NH_2 radicals as an illustration. (Author)

UCRL-6309 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
A PHOTOELECTRIC-RECORDING RAMAN APPARATUS, by A. Werbin and T. Anderson. Rept. on Contract W-7405-eng-48. 14 Mar 61, 29p.

PB 154 446 $5.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
INFRARED STUDIES: INTERFEROMETRY; DERIVATIVE ABSORPTION SPECTROSCOPY; FAR-INFRARED SPECTRUM OF H_2O_2; ELECTRIC FIELD INDUCED ABSORPTION IN H_2 AND D_2; STARK EFFECTS IN HCN, CH_3F, NH_3, AND H_2C, by Charles H. Church, Robert Hunt and others. Final rept. on Contract AF 19(604)2071. Aug 60, 58p. 15 refs. 2609-4-F; AFCRL-TR-60-433; AD-250 727.

DESCRIPTORS: Spectrographic analysis, Peroxides, Absorption, Electric fields, Hydrogen compounds, *Infrared radiation, *Infrared research, Infrared equipment, *Interferometers.

PB 161 592 $0.50

National Bureau of Standards [Washington, D. C.]
DETERMINATION OF THE K FLUORESCENCE YIELD OF ARGON BY PROPORTIONAL-COUNTER SPECTROMETRY, by Claire Godeau. May 61, 16p. 12 refs. Technical note no. 91.

DESCRIPTORS: *Argon, Fluorescence, Excitation, *Proportional counters, Design, Electrons.

A proportional counter spectrometer designed for investigation of low energy particles has been used for the determination of the K fluorescence yield of argon. X-rays following K capture in iron-55 were used as a source for excitation of the argon atom and the spectrum was measured. The K fluorescence yield ω_K was deduced from the comparison of the two peaks shown in the spectrum and corrections were made, taking into account photoelectric absorption in outer shells and reabsorption of secondary X-rays in the counter. The fluorescence yield ω_K of argon was found to be 0.087 ± 0.007.

ORNL-2969 $1.50

Oak Ridge National Lab., Tenn.
THE COSINE-CUBED NEUTRON SPECTROMETER, by J. H. Thorngate, G. S. Hurst and others. Rept. on Contract W-7405-eng-26. 59p.

PB 155 139 $3.60

Oslo U. (Norway).
STRUCTURE OF THE SOLID COMPOUND FORMED BY ADDITION OF TWO MOLECULES OF IODINE TO ONE MOLECULE OF PYRIDINE [AND] THE CRYSTAL STRUCTURE OF THE 1:1 ADDITION COMPOUND FORMED BY BENZYL SULPHIDE AND IODINE, by O. Hassel, H. Hope, and Chr. Romming. Technical scientific note no. 2 on Investigation of Molecular Structures, Contract AF 61(052)71. 24 Oct 60, 37p. 9 refs. AFOSR-40; AD-252 389.

DESCRIPTORS: *Crystal structure, *Crystals, Lattices, Pyridines, Iodine, Sulfides, Measurement, *Molecular structure, Organic compounds, Benzyl radicals, Chemical reactions.

Crystal structure of pyridine . 2 I_2: These crystals are monoclinic, space group P2 sub 1/c, lattice constants a equal to 4.42 b equal to 15.37, c equal to 17.65, and beta equal to 103.8 degrees. The unit cell contains 4 molecules of pyridine and 16 atoms of I. The compound can be designated as dipyridineiodine heptaiodide. Crystal structure of the addition compound of benzyl sulfide and iodine: The space group is Pnma, with 4 molecules of $(C_6H_5CH_2)_2S.I_2$ in the unit cell; a equal to 9.86, b equal to 16.86, c equal to 9.36 Angstroms.

PB 154 907 $5.60

Stanford U., Calif.
STEADY STATE NUCLEAR POLARIZATIONS VIA ELECTRONIC TRANSITIONS, by Robert H. Webb. Technical note no. 3 on Contract AF 18(603)131. Jan 61, 54p. 34 refs. Technical note no. 131-11; AFOSR-157; AD-251 923.

DESCRIPTORS: Rotating structures, Rotation, *Cryostats, *Instrumentation, *Nuclear magnetic dipole moments, Polarization, Electron transitions, Spin.

Included in the report is:
Crystal rotator for cryostat, by R. H. Webb and R. B. Griffiths. Technical note no. 131-9, AFOSR TN-60-1457, submitted to The Review of Scientific Instruments.
Nuclear polarization schemes are surveyed. Special attention is given to those involving saturation of either the direct electronic transitions (Overhauser and Underhauser effects) or the weakly forbidden electron-nuclear cross transitions (Jeffries and Solid effects.) Rate equations are used to find the power dependence of these effects. The physical systems allowing each of the effects are considered in terms of the various types of electron-nuclear coupling. Experimental work and bibliography to date are surveyed. (Author)

PB 156 295 $5.60

Syracuse U. Research Inst., N. Y.
INFRARED SPECTRAL EMISSIVITY OF TERRAIN, by W. R. Fredrickson, N. Ginsburg and others. Interim development rept. no. 2, 1 May-31 July 57, on Contract AF 33(616)5034. 1 Aug 57, 52p. AD-141 389.

This report released for sale to the public 6 June 61.

DESCRIPTORS: *Surface targets, *Thermal radiation, *Infrared radiation, *Infrared spectroscopy, *Infrared detectors, *Mapping, Photographic equipment, Aerial photography, Terrain, Temperature, Measurement, Targets.

The work reported consists of: (a) some additional instrumentation, namely, the construction of a second surface temperature measuring device, a carrying case and modification for insertion of filters for the total radiation radiometer, the beginning of a set-up for the measurement of absolute emissivities, and a simple anomometer; and (b) new data obtained and reduced on the transmission of filters for the radiometer, on surface temperature measurements, on correlation between total radiometer, spectral radiometer, surface temperature and visible light measurements, and terrain scan measurements with the portable total radiometer on regions not accessible with the spectral radiometer. Finally, a group of spectral radiation measurements is shown in the approved units of watts per cm^2 per micron per steradian. (Author)

Optics

PB 154 936 $3.60

Chalmers U. of Tech. (Sweden).
ON THE GEOMETRICAL THEORY OF DIFFRACTION WITH APPLICATION TO THE ELECTRON BEAM, by K. H. B. Wilhelmsson. Rept. no. 10 on Contract AF 61(052)159. 1960, 36p. 19 refs. Research rept. no. 9, 1960; AFCRL-TN-60-1138; AD-251 561.

DESCRIPTORS: Optics, *Electromagnetic waves, *Diffraction, Electron beams, Wave analysis, Projective geometry, Sweden.

A review of the history of optics is made and its connection with modern microwave optics. The geometrical theory in a suitable form is applied to study the diffraction of electromagnetic waves by an electron beam for oblique incidence. The exact wave solutions in the form of infinite series are obtained. The results are presented in the form of graphs, the numerical values being obtained with the aid of an electronic computer. (Author)

PB 155 658 $3.60

Little, Arthur D., Inc., Cambridge, Mass.
DEVELOPMENT OF THE "CLAM SHELL" THERMAL IMAGER, by Peter E. Glaser. Final rept. Jan 60-Feb 61, on Contract AF 19(604)6663. 10 Feb 61, 38p. 6 refs. C-62758; AFCRL-66; AD-254 040.

DESCRIPTORS: High temperature research, *Electric arcs, Instrumentation, Crystals, Growth, *Infrared images, *Infrared optical systems, Tests, Mirrors, Vacuum furnaces, Reflectors.

The following phases of development of the "clam shell" (compound reflective optical system) thermal imager are discussed: measurement of performance, instructions for use, and provisions for an evacuated or gas-filled image chamber suitable for crystal growing experiments.

PB 171 133 $2.25

Naval Research Lab., Washington, D. C.
TRANSMISSION OF LIGHT IN WATER: AN ANNOTATED BIBLIOGRAPHY, by Elsie F. DuPre and Leo H. Dawson. Apr 61, 88p. 657 refs. NRL Bibliography no. 20.

DESCRIPTORS: Water, *Light transmission, Optics, *Bibliography, *Light, Transmission.

This bibliography of about 650 entries on the transmission of light in water and related optical properties of water records information published throughout the world and covers a period of 141 years, 1818-1959. Most of the entries are annotated with special attention to those on light transmission. "Water," as used above, includes pure distilled water, lake water, and seawater. Although abstracting journals were of great value, many of the entries were obtained through references included in the classic articles. Early papers, mainly of Swiss, German, French, and Italian origin, indicate the initial interest in the color of natural waters with subjective conclusions until Secchi in 1865 resolved to settle some of the questions with direct experiments on seawater. The history of progress of the study of light in water closely follows advances in photometric instrumentation. Entries on the subject from the various countries reflect their particular interest in the sea. Entries from the United States are more in evidence in recent years, indicating the accelerated interest of the United States in maritime and naval affairs. This represents the contributions to hydro-optics of over 400 authors from over 150 periodicals and other sources. (Author)

PB 154 302 $5.60

Ramo-Wooldridge Div., Canoga Park, Calif.
RESEARCH ON THE DETECTION OF FAR INFRARED RADIATION, by B. R. Curtis. Final rept. on Contract AF 19(604)5222. 1 Dec 60, 55p. 31 refs. AFCRL-TR-60-435.

DESCRIPTORS: *Infrared radiation, Detection, *Radiometers, Design, Moon, Temperature, Sun, Measurement, *Microwave equipment, Thermal radiation, Electronic equipment, *Infrared equipment, *Infrared detectors.

Research is presented on the study, design and construction of equipment for the measurement of thermal radiation in the three millimeter (3000 micron) region of the electromagnetic spectrum. The radiometer constructed is described. The design incorporates techniques for the measurement of both the absolute intensity and the polarization of radiation received from various objects. Experimental tests and investigations of the feasibility of the design are also presented. (Author)

PB 171 853 $0.75

California Inst. of Tech., Pasadena.
SEMICONDUCTOR RESEARCH WITH THE ELECTRON PROBE X-RAY MICROANALYZER, by David B. Wittry. Final rept. on Metallurgical Applications of the Electronmicroprobe, Contract DA 04-495 [ORD] 1655. Jan 61, 22p. 6 refs. OOR no. 1920:2; AD-252 290.

DESCRIPTORS: *Semiconductors, Diffusion, *Zinc, *Gallium compounds, Arsenides, Intermetallic compounds, Single crystals, Microanalysis, X-ray absorption analysis, Electrons, Instrumentation, Phase studies, Solubility, Germanium.

The electron probe microanalyzer has been used with considerable success for study of the As-Ga-Ge system. The solubility of germanium in gallium arsenide was found to be about 1 ± .02% at 980 C and increases with decreasing temperature to values of about 2.5 to 3% at 850 C. In the germanium rich corner of the As-Ga-Ge ternary diagram, the solubilities may exceed the solubilities in the binary systems by a factor of 5 to 10.

PB 154 266 $1.60

Duke U., Durham, N. C.
STRESS IN THE VICINITY OF A CRACK IN A THICK ELASTIC PLATE, by M. Lowengrub. Rept. on Contract AF 18(600)1341. Nov 60, 17p. 11 refs. AFOSR TN-60-1449; AD-249 909.

DESCRIPTORS: *Stresses, Distribution, *Fracture (Mechanics), Elasticity, *Solids, Analysis.

The extension of Sneddon's (Proc. Roy. Soc. A. 187:229, 1946) method is considered for the case in which the thickness of the plate is T times the diameter of the circular crack. It is assumed that the equations of the classical (infinitesimal) theory of elasticity hold. The boundary conditions appropriate to two types of problems are formulated. The problem is then reduced to the solution of a pair of dual integral equations which are solved by a procedure due to Lebedev and Uflyand (J. Appl. Math. and Mech. 22:422, 1958). Exact analytical expressions are derived for the solution only in the case of large values of T. The procedure to be followed in a numerical discussion of the solution is illustrated by the calculation of the shape of the deformed crack. (Author)

PB 156 300 $1.10

Electrical Engineering Research Lab., U. of Illinois, Urbana.
RESEARCH ON THE ALTERATION OF THE SURFACE CHARACTERISTICS OF SEMICONDUCTORS BY THE DIFFUSION OF IMPURITIES. Final rept. on Contract AF 18(600)1310. 15 Sep 58, 7p. AFOSR-TR-58-136; AD-235 471.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Semiconductors, Surface properties, Diffusion, Impurities, Germanium, Silicon, Electric fields, Microwaves, Single crystals.

A study was made of the interaction of large microwave fields with semiconductors and the effect of diffusion on the surface properties of semiconductors. The study of the diffusion process in Ge and Si indicated that atoms may move through these materials in different ways depending upon the position of the element in the periodic table, its size, solubility, and state of charge. The study of the pulse field effect at low temperatures were the first measurement of the relaxation time of the surface states which are not important in recombination processes. This measurement is a practical method of using field effect devices. Electrons accelerated by a large electric field interacted with the semiconductor lattice to give non-ohmic conduction; the exact mode of interaction was dependent upon the temperature and density of the carriers.

PB 155 588 $3.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
COUNTER ADAPTOR AND FURNACE FOR WEISSENBERG CAMERA, by R. A. Young. Technical note no. 1 on Contract AF 49(638)624. Oct 60, 34p. 3 refs. AFOSR [TN] 60-1462; AD-253 799.

DESCRIPTORS: *X-ray diffraction cameras, Single crystals, Intensity, Temperature, Shielding, Heating, *Quartz crystals, Phase studies, Cameras, Crystals, *Atomic orbitals.

A rugged and versatile counter-adaptor for a Weissenberg camera is described. It has performed well in two years of daily use which has included collection of intensity versus temperature data with conventional cold stream techniques. Advantage has recently been taken of the adaptor design to mount, directly on the Weissenberg base, a furnace device which blows hot air along the crystal mounting axis. Crystal temperature may be held constant or easily varied over the range up to about 700°C, with no obstruction of the x-ray beams and no readjustment of the furnace position, while the entire zero layer and close-in upper layers are explored. (Author)

PB 156 302 $5.60

Halex, Inc., El Segundo, Calif.
PHYSICS OF THIN RESISTIVE FILMS, by E. R. Olson and G. L. Vajda. Scientific rept. no. 2, 1 Oct-31 Dec 59, on Contract AF 33(616)6685. 31 Dec 59, 51p. AD-230 381.

This report released for sale to the public 6 June 61.

DESCRIPTORS: *Thin films, Resistance, Production, *Electrical properties, Temperature, Electron bombardment, Tests.

Information is presented on the relationships between electrical behavior and process parameters for nichrome, nichrome-silicon, and nichrome-silicon oxide films. The results of other investigators are correlated with present results in regard to the effect of process parameters on film properties. Preliminary data on the relationships between structure, stress and electrical properties are discussed. (Author)

PB 154 851 $2.60

Illinois Inst. of Tech., Chicago.
THE ROLE OF CRYSTAL STRUCTURE IN DIFFUSION. PART I. DIFFUSION PATHS IN CLOSEST-PACKED CRYSTALS, by Leonid V. Azároff. Rept. on Contract AF 49(638)425. 1 Dec 60, 21p. 13 refs. AFOSR TN-60-1353; AD-251 755.

DESCRIPTORS: *Crystals, *Crystal structure, *Diffusion, Lattices, Sodium compounds, Chlorides, Metals, Impurities, *Metallic crystals.

A consideration of the crystal structures of simple binary compounds shows that they can be represented by closest packings of the larger anions in which two kinds of interstices are available for occupation by the metal atoms. In hexagonal closest packings the octahedral voids form continuous chains by sharing opposite faces while the tetrahedral voids form isolated pairs. In cubic closest packings each kind of void shares faces only with unlike voids. The specific diffusion paths available in these compounds depend, therefore, on the manner in which the voids are occupied. (Author)

PB 154 852 $1.60

Illinois Inst. of Tech., Chicago.
THE ROLE OF CRYSTAL STRUCTURE IN DIFFUSION. II. ACTIVATION ENERGIES FOR DIFFUSION IN CLOSEST-PACKED STRUCTURES, by Leonid V. Azaroff. Rept. on Contract AF 49(638)425. 1 Dec 60, 11p. 12 refs. AFOSR TN-60-1354; AD-251 756.

DESCRIPTORS: *Metallic crystals, *Crystals, *Crystal structure, *Diffusion, Lattices, Impurities, Energy, *Bismuth compounds, Selenides, Intermetallic compounds, Zinc compounds, Oxides, Silver compounds, Iodides.

The effect of available diffusion paths on activation energies are considered for silver iodide, zince oxide, and bismuth selenide. It is shown that the energy in β-AgI should be nearly twice that in γ-AgI because the Ag atoms in tetrahedral sites first must be displaced to octahedral voids before voidal diffusion can occur in the β modification. The 2:1 ratio between the self-diffusion energies of Zn determined by radioactive tracer and electrical conductivity measurements in ZnO is similarly explained. It is also shown that the difference between the activation energies for diffusion in BiSe and Bi_2Se_3 can be used to determine the formation energy of vacancies in BiSe. (Author) (See also PB 154 851)

PB 154 713 $1.60

Illinois U. [Urbana].
THE PROPERTIES OF DISLOCATIONS IN CRYSTALS, by R. Thomson. Final rept. on Contract AF 49(638)420. 15 Sep 60, 18p. 9 refs. AFOSR-TR-60-141; AD-251 103.

DESCRIPTORS: *Crystals, Lattices, Stresses, Deformation, Atomic structure, Plasticity, Physical properties, Theory, Silicon, Germanium, Crystal structure.

Experimental and theoretical work was addressed to problems concerning the properties of atoms in the core of a dislocation where the distortion of the crystal structure is very high. Theoretical studies have (1) worked out the rate with which vacancies can be absorbed or created in the crystal from the dislocation core, and (2) considered how the core of the dislocation behaves when the dislocation moves from one place in the crystal to another. Experimental studies were conducted on: (1) diffusion of atoms along the core, and (2) on dislocation mobility under stress. The diffusion along dislocations is thought to be very fast. (Author)

PB 155 127 $3.60

Kentucky Research Foundation, Lexington.
A STUDY OF THE TRANSIENT BEHAVIOR AND THE SWITCHING EFFECT IN ANTIMONY TRISULFIDE, by J. R. Davis, Jr. Technical note on Electrical, Optical and Thermal Properties of the $M_2^{Vb} N_3^{VIb}$ Semiconductors, Contract AF 49(638)90. 17 Dec 60, 40p. 39 refs. AFOSR-121; AD-254 239.

DESCRIPTORS: *Antimony compounds, Sulfides, *Dielectrics, Dielectric properties, Voltage, Electrical properties, Resistance, Electrical conductance, Electric fields, Sensitivity, Crystals, Crystal structure, *Semiconductors.

The primary concern of this paper is to describe the design of precise experiments by which the important time and electric field dependent characteristics associated with the "switching effect" in stibnite were measured. Experiments are described with which temperature dependent properties, pre-breakdown pulses, and delayed breakdown behavior were examined. Stoichiometric stibnite, Sb_2S_3, undergoes dielectric breakdown when subjected to an electric field of about 10^6 volts/cm which is of the same order as required to breakdown most dielectrics. However, it was discovered that stibnite containing 1% or more excess antimony undergoes breakdown with much smaller applied fields, about 1000 volts/cm and with removal of the field the sample resistance is found to be about four orders of magnitude smaller. In the case of stibnite there is no evidence of decomposition. It was also found that original high resistance of the samples could be restored by heating. (Author)

PB 171 836 $1.00

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
SOME DEVELOPMENTS IN HIGH-PRESSURE TECHNIQUE, by P. W. Forsbergh, Jr. Rept. on Contract Nonr-1841(10). June 60, 40p. 32 refs. Technical rept. 151; AD-238 164.

DESCRIPTORS: *High pressure research, Pressure, Solids, Gases, Metals, Hydraulic seals, Measurement.

Various research problems requiring high-pressure techniques were investigated. Consideration is given to solids and gases as pressure media, typical metals used in high-pressure design and methods of making seals (hydraulic and electrically insulating seals). Examples of high-pressure design are presented which include 2-dimensional pressure holders, precompressors,

systems with lapped quartz seals, systems with optically flat quartz seals, systems with hydraulically loaded closures, and systems with hydraulically loaded piston gaskets. The measurement of pressure, length, and lattice parameters is discussed.

PB 171 823 $0.75

Materials [Lab.] Wright Air Development Div., Wright-Patterson AFB, Ohio.
PHASE RELATIONSHIPS IN TANTALUM-RICH TANTALUM-RUTHENIUM ALLOYS AT 1500 C, by C. S. Hartley, E. J. Rapperport (Nuclear Metals, Inc.) and others. Rept. for May-Nov 60, on Metallic Materials. Mar 61, 25p. 5 refs. WADD Technical note 60-288; AD-254 350.

DESCRIPTORS: *Tantalum, *Ruthenium, Alloys, Metals, Transition elements, *Phase studies, *High temperature research, Processing, Solubility, Lattices, Crystal structure, *Refractory materials, *Heat resistant alloys.

Six arc-melted and homogenized alloys of tantalum and ruthenium containing 10, 20, 30, 40, 45, and 50 atomic percent ruthenium were heat-treated for 168 hours at 1500°C and quenched. Structure and lattice parameters of the alloys were determined by X-ray powder photographs. Solubility of ruthenium in tantalum at 1500°C lies between 20 and 30 atomic percent. An intermediate phase having the stoichiometric composition TaRu exists from between 20 and 30 atomic percent ruthenium to 48 ± 2 atomic percent. Room temperature structure of TaRu is based on CsCl (Type B_2) at 30 percent ruthenium composition, but distorted CsCl at the 40 and 45 atomic percent compositions. Complete X-ray data for all alloys are presented. (Author)

PB 154 733 $2.60

Michigan U. Coll. of Engineering, Ann Arbor.
SURFACE HETEROGENEITY: A MODERN VERSION, by G. Parravano. Rept. on Contract AF 49(638)493. Jan 61, 22p. 17 refs. 2832-13-T; AFOSR [TN]-60-1460.

DESCRIPTORS: *Surfaces, Surface properties, *Crystals, Growth, Solids, Single crystals (Metallurgy).

Surfaces of real crystals possess sites with varying affinity for gas phase species. Variations in thermodynamic affinity extend in both time and location of the surface. The result is a surface with a dynamic distribution of energy. The distribution function is a basic factor in controlling the physicochemical behavior of the surface. The combined effects of dislocations and whiskers growing on the surface provide a satisfactory model for the dynamic heterogeneity of surfaces. The kinetics and mechanisms of whisker growth are discussed in some detail, and the implications of the growth kinetics on surface heterogeneity are emphasized. In addition, the role of filamentary growth on sintering of high area catalysts is briefly pointed out. (Author)

PB 161 591 $1.25

National Bureau of Standards [Washington, D. C.]
FLUX SWITCHING MECHANISMS IN FERRITE CORES AND THEIR DEPENDENCE ON CORE GEOMETRY, by George William Reimherr. May 61, 49p. 14 refs. Technical note no. 90.

DESCRIPTORS: *Ferrite cores, Magnetic core switches, Design, Switches.

Plots of reciprocal switching time against applied magnetic field for ferrimagnetic or ferromagnetic cores usually show two or three interconnecting straight line segments. Different theoretical flux reversal mechanisms have been proposed for each segment. Descriptive models of these mechanisms are presented. Switching curves are shown for seven ferrite cores of different composition, and for a ferromagnetic tape core. The inverse slope of the switching curve known as the switching coefficient, was calculated for these cores and it is shown to agree well with values given by other experimenters and by theory. Experiments were made to ascertain whether the flux reversal mechanisms are affected by core geometry. Nine ferrite cores were separated into four groups. The cores of each group had identical chemical composition and originally had nearly equal cross sections and identical switching curves. The cores of each group were then ground into different cross sections, at least one being rectangular and the other being square or circular, and switching curves were again taken of these cores. No effect of geometry upon the flux reversal mechanisms was found. Several factors which may affect the switching coefficient are given.

PB 171 817 $0.75

Naval Ordnance Lab., White Oak, Md.
SHOCK-INDUCED LUMINESCENCE, by M. Solow, R. C. Wiley, and N. L. Coleburn. 23 Jan 61, 23p. 18 refs. NAVORD rept. 6911; AD-254 890.

DESCRIPTORS: *Metals, *Luminescence, Surface properties, Shock waves, Optics, Aluminum compounds, Oxides, Explosives, Detonation, Light, Reflection.

When a 270 kilobar shock wave emerges from an illuminated aluminum surface in a vacuum, blue light is emitted. This phenomenon is affected significantly by surface conditions. A chemically-formed aluminum oxide surface layer on the metal luminesceses brightly for at least 0.64 microseconds. Normally oxidized aluminum surfaces luminesce less brightly for a much shorter time (~0.01 microseconds). The effect of non-oxidized material on the phenomenon is shown in that shocked gold does not luminesce. The luminescence from aluminum is attributed to electrons, dragged by the shock (acoustoelectric effect). The electrons reach the aluminum oxide layer and, falling into the ionized F^+ centers, emit blue light. (Author)

PB 156 106 $6.60

Ohio State U. Research Foundation, Columbus.
AN INVESTIGATION OF THE TRANSFORMATION AND STRUCTURE OF SILVER MERCURIC IODIDE, by C. E. Olsen and P. M. Harris. Technical rept. no. 2 on Contract AF 18(600)769. Aug 59, 70p. 39 refs. RF proj. 567; AFOSR-TN-59-756; AD-229 755.

DESCRIPTORS: Silver compounds, Mercury compounds, *Iodides, *Single crystals, Crystal structure, X-ray diffraction analysis, Phase transitions, Transition temperature.

Single crystals of Ag_2HgI_4 were grown from solution. They undergo transformation at ~ 51°C without shattering. The transformation at 51° clearly shows that the initial phase obtained from solution is not again obtained. Transitions are shown from β' phase at less than 51°C, α phase from 51°C to 157°C, and β phase back to less than 51°C. The unit cell of the β'-phase contains 2 molecules Ag_2HgI_4 ideally and is tetragonal with a = 6.32 A, c = 12.64 A, c/a = 2 exactly. It is body-centered with symmetry I4. Evidence is adduced supporting the hypothesis that the β' crystals are nonstoichiometric and exhibit iodine vacancies with a portion of the silver ions in interstitial sites. The β-phase, obtainable from the α-phase appears to have a cubic, primitive cell, a = 12.64 A. (Author)

PB 156 107 $4.60

Ohio State U. Research Foundation, Columbus.
LAUE-BRAGG SCATTERING AND CHARGE DISTRIBUTION IN LITHIUM HYDRIDE, by Travis J. Phillips (Doctoral thesis) and P. M. Harris. Technical rept. no. 3 on Contract AF 18(600)769. Sep 59, 45p. 27 refs. RF proj. 567; AFOSR-TN-59-757.

DESCRIPTORS: Lithium compounds, *Hydrides, Crystal structure, X-ray diffraction analysis, Single crystals.

Intensities of scattering from single crystals of LiH have been obtained at room temperature and at approximately 100°K. Values of relative crystal structure factors, Fhkl, and relative atomic form factors have been derived from the measured intensities.

PB 156 278 $2.60

Plastics Lab., Princeton U., N. J.
CARRIER BEHAVIOR IN NICKEL-DOPED POLYMER CARBONS, by H. A. Pohl and J. P. Laherrére. Rept. on Contract DA 36-039-sc-78105. 15 June 59, 26p. 14 refs. Technical rept. 54A.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Semiconductors, Electrical properties, Preparation, Materials, Nickel, Impurities, Polymers, Carbon.

In examining the conductivity and Hall coefficients of a series of variously heat-treated and nickel-doped polymer carbons prepared from variously loaded ion exchange resins by pyrolysis it was observed that the Hall mobility increases with impurity addition in these condensed molecular solids. A theoretical interpretation of the conduction in such inhomogeneous molecular solids is suggested. An alternate interpretation based upon a barrier layer model is also considered.

PB 156 279 $5.60

Plastics Lab., Princeton U., N. J.
SEMI-CONDUCTION IN NICKEL-DOPED POLYMER CARBONS, by H. A. Pohl and J. J. Hoglen. Rept. no. 2 on Contract DA 36-039-sc-78105. 15 Apr 59, 53p. 62 refs. Technical rept. 53D.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Semiconductors, Electrical properties, Preparation, Materials, Nickel, Impurities, Polymers, Carbon.

A study was made of the preparation and the electrical character of semi-conductors made of nickel-doped polymer carbon. These materials were made from variously nickel-loaded ion exchange resins which were then pyrolysed to temperatures ranging from 700°C. to 1200°C. and in yields of about 13%, based on dry resin. The electrical conductivity and its temperature coefficient and the Hall coefficient were studied, and the pyrolysis and conduction mechanisms were examined. Nickel contents up to 12 atom % were studied.

PB 171 837 $0.75

South Dakota School of Mines and Tech., Rapid City
HIGH-TEMPERATURE THERMAL CONDUCTIVITY MEASUREMENTS IN SEMICONDUCTORS, by Robert G. Morris. Annual summary rept. on Contract Nonr-2964(01). 1 July 60, 23p. 26 refs. AD-239 000.

DESCRIPTORS: *Semiconductors, Bismuth compounds, Tellurides, *Heat transfer, Silicon, Thermocouples, Measurement.

Measurements were made of the contact and bulk thermal conductivities of semiconductors, including Bi_2Te_3 and Si, at above room temperatures by a means of a comparison method. This method requires the use of a standard of known conductivity. Measurements on p-type polycrystalline Bi_2Te_3 were made up to temperatures as high as 330°C. Contacts were made between the Bi_2Te_3 sample and the standard (Armco iron) with solder, in which case the Armco iron was first tinned, or by the use of Apiezon L vacuum grease on bare surfaces. A series arrangement was used whereby the sample was sandwiched between 2 standards. The standards were soldered directly to the heat source and sink. Armco iron (99.9+ % Fe) was not a suitable standard to use with Bi_2Te_3 since the difference in conductivity, 0.17 and 0.005 cal/cm sec deg C, respectively, was so great. Chromel-alumel thermocouples with butt-welded junctions were used. Temperature differences were measured by means of a comparator circuit. The temperature of the sample was monitored continuously on a self-balancing recording potentiometer. The results indicated that the relationship between the heat, Q, and the conductivity is usually linear but is affected by radiation or conduction losses or gains.

PB 155 219 $1.60

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Ni_3Si_2 WITH SOME NOTES ON Ni_5Si_2, by Gunvor Pilström. Technical note no. 18 on Contract AF 61(052)40. 15 Oct 60, 18p. 9 refs. AFOSR-TN-60-1080; AD-252 922.

DESCRIPTORS: *Crystal structure, *Crystals, Nickel compounds, *Silicides, Single crystals, Silicon compounds.

The crystal structure of Ni_3Si_2 has been determined from single crystal data. The unit cell is orthorhombic and contains 16 formula units. The unit cell dimensions are: a = 12.229, b = 10.805, and c = 6.924 angstroms. The nickel atoms are situated in four eight-fold and four four-fold positions and the silicon atoms are situated in three eight-fold and two four-fold positions. The single crystal data have also been used to determine the symmetry and unit cell dimensions of Ni_5Si_2 for which a trigonal unit cell has been found. (Author)

PB 155 220 $1.60

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Pd_5B_2, (Mn_5C_2) AND Pd_3B, by Erik Stenberg. Technical note no. 20 on Contract AF 61(052)40, 1 Nov 60, 18p. 17 refs. AFOSR-TN-60-1120; AD-252 823.

DESCRIPTORS: *Crystals, *Crystal structure, Palladium compounds, Boron compounds, *Intermetallic compounds, Single crystals, Lattices, Borides.

The crystal structures of Pd_5B_2 and Pd_3B were determined by single crystal methods. Pd_5B_2 has a monoclinic unit cell with the following dimensions: a = 12.786, b = 4.955, c = 5.472 angstroms; β = 97 degrees 2 minutes. Pd_3B has the cementite (Fe_3C) structure. The space-group is Pnma with a = 5.463, b = 7.567, c = 4.852 angstroms.

PB 155 218 $1.60

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Re_2P, by Stig Rundqvist. Technical note no. 9 on Contract AF 61(052)40. 15 Oct 60, 14p. 16 refs. AFOSR-TN-60-1079; AD-252 921.

DESCRIPTORS: Crystals, *Crystal structure, Rhenium compounds, *Phosphides, X-ray diffraction analysis, Single crystals.

The crystal structure of Re_2P was determined by X-ray powder methods. The structure belongs to the C23 type. The dimensions of the orthorhombic unit cell are: a = 5.540; b = 2.939; c = 10.040 angstroms. The space group is Pnma. The Re_2P structure is compared with that of Ru_2P, and notable differences are indicated. The present investigation was undertaken in view of the possible structural relationships between Re_2P and the phosphides of the platinum metals. (Author)

PB 154 308 $13.00

Westinghouse Electric Corp., Youngwood, Calif.
RESEARCH IN THE PREPARATION OF HYPERPURE SINGLE CRYSTAL SILICON CARBIDE, by D. R. Hamilton, T. L. Chu and others. Final rept. for Feb 57-June 59 on Contract AF 19(604)2174. 4 Oct 60, 189p. 23 refs. AFCRL-TR-60-368; AD-250 119.

DESCRIPTORS: *Single crystals, *Silicon compounds, Carbides, Purification, Growth, Sublimation, Crystal structure, Deformation, Semiconductors.

The work is concerned with the preparation of SiC crystals of highest purity. While the technique used is basically that of Lely, much of the work is concerned with the methods by which the over-all purity has been increased at least an order of magnitude. Pure SiC now means reproducible samples of thousands to hundreds of thousands ohm cm resistivity (room temperature), with impurity levels of the order of 10 to the 16th power atoms/cc. Hall measurements indicate that the density of electrically active levels may be as low as 10 to the 14th power/cc. The over-all morphology of samples prepared in the laboratory is described. A section is devoted to the origin of screw dislocations which have played such a prominant role in recent studies of spiral growth steps on SiC surfaces, while other samples are shown to be atomically flat. Preliminary studies with the plasmajet have demonstrated its suitability for high temperature reaction studies. (Author) (See also PB 145 370)

Theoretical Physics

PB 154 987 $2.60

Catholic U. of America, Washington, D. C.
AN LCAO STUDY OF Be_2, by Robert Hampson and J. S. Dooling. Rept. on Contract AF 18(600)1537. [1960] 27p. 11 refs. AFOSR-TN-60-91.

DESCRIPTORS: *Beryllium, Atomic orbitals, *Atomic energy levels, Excitation, Energy, Crystals, *Quantum mechanics, Mathematical analysis, Configuration, Atoms.

These calculations were made to study the interaction of two Be atoms as related to crystal formation. The effect of including 2p Sigma atomic orbitals in the calculation was studied. An excited state calculation was made to see whether this state would exhibit binding.

PB 155 039 $9.10

Geophysics Corp. of America, Bedford, Mass.
ENERGY LOSS PROCESSES OF SOLAR CORPUSCLES IN AIR, by P. J. Nawrocki and R. Papa. Scientific rept. no. 4 on Contract AF 19(604)7405. Feb 61, 111p. 75 refs. GCA Technical rept. 61-12-A; AFCRL-26; AD-252 533.

DESCRIPTORS: *Solar energy, Energy, *Photons, Electrons, Atmosphere, Gamma rays, *Nuclear reactions, Quantum mechanics, Particles, *Cosmic rays, Ionization, Photoelectric effect, Fluorescence.

Contents: Photons and electrons in air, including studies on the photoelectric effect, Compton and Klein-Nishina scatter, pair formation, transmission of games in finite air slabs, build-up factors, stopping power of gases (for electrons), primary and secondary electrons, subexcitation electrons, rate of energy loss

of slow electrons, excitation by electrons, rate of energy loss of slow electrons, excitation by electrons, and ionization by electrons; Photons in air, including studies on resonance charge transfer, electron capture into excited states, total electron capture cross section, excitation and ionization by proton impact, equilibrium fraction of II plus - II beam, stopping power of gases, mean energy per ion pair, ionization rates, excitation and ionization by neutral hydrogen, impact, and total loss cross sections for H; Radiative phenomenon, pertaining to fluorescence efficiencies, night airglow, and aurorae; Potential wells of atmospheric gases, including important fractures of the diatomic molecule, the Morse function, the Morse diagrams of O_2, N_2, and NO, lifetimes of the metastable states, selection rules for radioactive transitions, the Franck-Condon principle, and the noncrossing rule.

PB 155 591 $2.60

Microwave Lab., Stanford U., Calif.
INVESTIGATION OF MICROWAVE PROPERTIES OF PLASMAS, by M. Chodorow. Scientific rept. no. 10, 1 Aug-31 Oct 60, on Contract AF 19(604)5226. Jan 61, 29p. 8 refs. M.L. rept. no. 776; AFCRL-7; AD-253 848.

DESCRIPTORS: *Plasma physics, Noise, Magnetic fields, Electron beams, Microwave amplifiers, Cesium electron tubes, *Microwaves, *Wave transmission, Harmonic analysis.

Contents:
Plasma research
  Thermal plasmas
  Noise in plasmas
  Harmonic generation in plasmas
  Cesium plasma tube materials and techniques
Other plasma studies
  Electron beam interaction with a plasma
  Plasma parametric amplifier
  High frequency loss mechanisms for plasmas
  Plasma diagnostic techniques
  Plasma confinement
  Plasma studies
(See also PB 153 098)

PB 155 791 $2.60

Plasma Propulsion Lab., Republic Aviation Corp., Farmingdale, N. Y.
THE EFFECT OF VARIABLE PLASMA CONDUCTIVITY ON MHD ENERGY CONVERTER PERFORMANCE, by W. B. Coe and C. L. Eisen. Rept. on Contract AF 49(638)552. Oct 60, 22p. 8 refs. PPL-TR-60-16 (176); AFOSR TN-[60-1439]; AD-254 674.

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, Fluid flow, Mathematical analysis, Mach number, Temperature, Magnetic fields, *Electrical conductance, *Thermodynamics, *Energy, Tests, Design, *Subsonic flow, Ablation, Materials.

The required entrance flow Mach number for maximum power density increases as the entrance stagnation temperature is increased. For the temperature range of immediate interest (2000°K-5000°K) the required entrance Mach number is always subsonic. In the construction of an actual MHD energy converter, the subsonic Mach number requirement permits more flexibility in the design, and lends more validity to the approximations made in the analysis than would be true for a supersonic energy converter. The attainable power density increases sharply with increases in entrance stagnation temperature. Since the maximum temperature that an MHD energy converter can operate at is limited by the capabilities of the materials involved, the reward of large increases in performance for small increases in operating temperatures provides a strong incentive for sophistication in design and for the accomplishment of even small increases in materials capability. (Author)

PB 155 123 $1.60

Polytechnic Inst. of Brooklyn, N. Y.
EXCITATION OF PLASMA WAVES BY BODIES MOVING IN IONIZED ATMOSPHERE, by K. P. Chopra. Rept. on Contract AF 49(638)445. Jan 61, 16p. 8 refs. PIBAL rept. no. 627; AFOSR-1; AD-252 225.

DESCRIPTORS: *Plasma physics, Electromagnetic waves, *Magnetohydrodynamics, Gas ionization, Atmosphere, Bodies of revolution, Blunt bodies, Excitation, Wave characteristics, Motion.

A body moving in an ionized atmosphere acquires an electric charge through the processes of accretion of charge particles and emission of electrons by high energy photons. Of particular interest is the situation in which the body collects an ionized cloud in front of it. The motion of this ionized cloud in the atmosphere induces an electrostatic instability and causes a column of ionized gas to move ahead of the body. The electrostatic instability is conducive to the excitation of electrostatic oscillations which, if already present, are further enhanced. A magnetic field along the direction of motion assists in the formation of the ionized cloud. If the pervading magnetic field is of suitable weak strength, it may excite extraordinary electromagnetic waves. A pervading transverse magnetic field of suitable strength may cause the excitation of magnetohydrodynamic waves. (Author)

SCTM-111-61(71) $0.50

Sandia Corp., Albuquerque, N. Mex.
PRELIMINARY STUDY OF SPECTROGRAPHIC TEMPERATURE MEASUREMENTS OF AN ARGON PLASMAJET, by K. L. Shipley. May 61, 14p.

PB 154 910 $4.60

Sindel, S. p. A., Rome (Italy).
PROPAGATION CHARACTERISTICS OF A MAGNETO IONIC DUCT, by D. Formato and A. Gilardini. Technical (scientific) note no. 1 on Contract AF 61(052)145. 31 Mar 60, 43p. 6 refs. AFCRL-TN-60-982, AD-251 924.

DESCRIPTORS: *Plasma physics, *Magnetic fields, Electromagnetic waves, Electromagnetic theory, Propagation, *Wave analysis, Attenuation, Dielectrics.

The propagation characteristics of a uniform magnetoionic duct of circular cross-section are determined

for signal frequencies smaller than the cyclotron frequencies. The ratios (plasma wavelength)/(free space wavelength) and (power flowing in the plasma)/(power flowing outside) are evaluated and discussed as a function of the diameter/wavelength ratio and of the plasma permittivity, for the propagation of circularly symmetrical modes. The attenuation due to the electron-molecule collisions and the propagation characteristics of all modes, for a plasma frequency much smaller than the signal frequency, are also briefly discussed. (Author)

Thermodynamics

PB 154 918 $1.10

Bureau of Mines, Bartlesville, Okla.
TRIMETHYLALUMINUM: THERMODYNAMIC FUNCTIONS IN THE SOLID AND LIQUID STATES, 0-380°K; VAPOR PRESSURE, HEAT OF VAPORIZATION, AND ENTROPY IN THE IDEAL GAS STATE, by John P. McCullough. Technical note on Contract CSO 59-9; ARPA Order no. 24-59, Task 3; AFOSR TN-60-1477; AD-251 623.

DESCRIPTORS: *Thermodynamics, Temperature, Vapor pressure, *Aluminum compounds, Entropy, Methyl radicals, *Metalorganic compounds.

An investigation is being made of thermodynamic properties of selected organic derivatives of elements in the second and third rows of the periodic table. If feasible, these results are to be used with spectroscopic and molecular structure data in order to calculate chemical thermodynamic functions in the ideal gas state in the range of 0 to 1500°K, and in evaluating thermochemical bond energies.

PB 156 119 $2.60

California U., Berkeley.
THE TWO RADIOMETER METHOD FOR THE SIMULTANEOUS DETERMINATION OF EMISSIVITY AND SURFACE TEMPERATURE, by R. V. Dunkle and J. T. Gier. Rept. 6 on Thermal Radiation Project, Contract N7onr-295, Task I. 14 Dec 48, 28p. 6 refs. ATI-91 560.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Surfaces, Temperature, *Thermal radiation, Determination, *Radiometers.

A technique of evaluating surface temperatures and "mean effective" emissivities is described. This method is unique in that it enables the evaluation of emissivity without the use of surface temperature measurement which in many cases contains inherent errors, and the method does not require heating of the sample. Data on several test samples are presented and compared with similar data obtained by other techniques. (Author)

PB 155 628 $4.60

David Sarnoff Research Center, Princeton, N. J.
HIGH TEMPERATURE SEMICONDUCTOR RESEARCH, by J. Blanc, R. H. Bube and others. Scientific rept. no. 4, 1 Oct-31 Dec 60, on Contract AF 19(604)6152. 31 Jan 61, 42p. AFCRL-55; AD-254 074.

DESCRIPTORS: *Semiconductors, *High temperature research, *Gallium compounds, *Phosphides, Single crystals, Diffusion, Temperature, Arsenides, Thin films, Scattering, Growth, Electrical properties, Crystals.

An apparatus was completed for the growth of GaP single crystals from the melt by the magnetic Czochralski technique in an autoclave. Experiments were initiated on the preparation of thin crystalline films of GaAs using iodine as the transport agent. Measurements of Hall mobility as a function of light excitation intensity at room temperature have shown a strong dependence of mobility on intensity in single crystals of CdS, CdSe, GaAs, and InP. One simple type of such variation follows the functional dependence on carrier density expected of a change in scattering resulting from a change in occupancy of scattering centers. When such data are analyzed in terms of a point-defect scattering model, using independently determined center densities, giant scattering cross-sections of the order of 10^{-11} to 10^{-10} cm^2 are calculated. Both n- and p-type single crystal layers of GaAs have been grown epitaxially using the method of surface decomposition and redeposition. Junction areas as large as 1-1.25 cm^2 have been fabricated. Permanent degradation of GaAs tunnel diodes has now been observed at room temperature when current is passed through the diode. However, no degradation is observed at 200°C when no current is flowing. The junction temperature is believed to be below 100°C when current is flowing. (Author) (See also PB 153 965)

PB 156 114 $5.60

Stanford U., Calif.
HEAT TRANSFER AND FLOW FRICTION CHARACTERISTICS OF CROSSED-ROD MATRICES, by A. L. London, J. W. Mitchell, and W. A. Sutherland. Technical rept. no. 41 on Contract Nonr-225(23). 15 July 59, 60p. 16 refs. AD-226 315.

This report released for sale to the public 14 June 61.

DESCRIPTORS: *Porous materials, Wire screens, *Heat transfer, Gas flow, Friction.

The program on porous media heat transfer and flow friction behavior is continuing. All the previous results of interest to the designer on woven-screen matrices and crossed-rod matrices of a random configuration are summarized. In addition, new design results for the regular inline and regular staggered crossed-rod matrix configurations are reported. Matrices of the type considered may find application as heat transfer surface geometries for periodic-flow type heat exchangers used for gas turbine regenerators and for some air conditioning applications, and also for nuclear reactor fuel elements, or for electrical resistance heaters. (Author)

PB 156 332 $7.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A LIGHT-MODULATED PANEL TECHNIQUE FOR MEASURING MICROWAVE NEAR-FIELDS AND APERTURES, by Byron C. Potts. Rept. on Radar Reflection Studies and Techniques, Contract AF 33(616)5341. 31 July 59, 73p. 43 refs. Rept. 777-16; AD-225 094.

This report released for sale to the public 19 June 61.

DESCRIPTORS: *Radar reflections, Electric fields, Antennas, *Electromagnetic waves, Photoconductivity, Test methods, Modulation.

In the past, it has been found that a photoconductive panel changes its electromagnetic properties when exposed to high light intensities. When the impinging light intensity is modulated, a modulation of an electromagnetic wave incident on the panel occurs. Application of the principle of the modulated photoconductive panel to the measurement of electric field aperture distributions in antennas is discussed, and the aperture distribution of an electromagnetic horn is measured within an accuracy of 5% in amplitude and 8° in phase. An analysis of the use of the modulated photoconductive panel in applications involving only one transmission through or only a single reflection from the modulated photoconductive panel are discussed. The applications discussed are an extension of the present applications of the photoconductive panel to reflectivity measurements and the location of principal scatterers on complex bodies. (Author)

PB 155 034 $1.10

Antenna Lab., Calif. Inst. of Tech., Pasadena.
ON THE INDEX OF REFRACTION OF SPATIALLY PERIODIC PLASMA, by C. H. Papas. Technical rept. no. 25 on Contract AF 18(600)1113. Jan 61, 7p. 3 refs. AFOSR-82; AD-251 880.

DESCRIPTORS: *Refractive index, Propagation, *Plasma physics, *Electromagnetic waves, Mathematical analysis.

A knowledge of the change produced in the index of refraction of a uniform plasma by the spontaneous generation of coagula or inhomogeneities is essential to the use of electromagnetic waves as a diagnostic tool. The general problem is difficult but certain nontrivial cases are mathematically tractable. One of these, which is also of some practical import, occurs when the inhomogeneities are periodically distributed throughout the plasma. This special case is analyzed within the framework of the theory of periodic structures. The problem is reduced by virtue of Floquet's theorem to an equivalent problem for the domain of a unit cell with periodic boundary conditions. An approximate solution is obtained by a simplified theory. As a specific application the calculation for a plasma with periodically spaced spherical inhomogeneities is worked out in detail. (Author)

PB 154 726 $1.60

Electrical Engineering Research Lab., U. of Texas, Austin.
STUDIES IN TROPOSPHERIC PROPAGATION. Final rept. on Contract AF 19(604)2249, continuation of Contract AF 19(604)494. 31 Dec 60, 16p. 11 refs. Rept. no. 6-41; AFCRL-TR-60-377; AD-251 286.

DESCRIPTORS: *Meteorological radio, Atmosphere, *Microwaves, *Propagation, Electromagnetic waves, Refractive index, *Atmospheric refraction, Statistical analysis.

Contents:
General survey of contract activities
Statistical analyses involving turbulent structure of the atmosphere
Scatter propagation signals
Microwave refractive index observations
Temperature fluctuations
Development of data analysis techniques
Radiometeorology
Millimeter absorption and solar emission.

PB 154 727 $1.60

Electrical Engineering Research Lab., U. of Texas, Austin.
STUDY OF PROPAGATION CHARACTERISTICS OF THE ATMOSPHERE, by B. M. Fannin and H. D. Wade. Final rept. on Contract AF 19(604)5504, continuation of Contract AF 19(604)2249. 31 Oct 60, 11p. Rept. no. 6-40; AFCRL-TR-60-378; AD-251 287.

DESCRIPTORS: Electromagnetic waves, *Microwaves, Radio transmission, *Atmosphere, *Propagation, Refractive index, Ionospheric propagation, *Wave transmission.

Wave propagation through a tropospheric layer of anisotropic turbulence was studied by comparing both the wave theory (microwave optics) approach, applicable to homogeneous layers, and the single scattering (first Born approximation) approach applicable to homogeneous turbulence. The first order correspondence of wave theory and single scattering theory results for the homogeneous layer (at least for the normal incidence) indicated that a single scattering theory approach can be expected to give valid approximations of the propagation effects produced by nearly homogeneous layers. The single scattering theory formulation of turbulent layer problem is more complex due to the mathematics necessary to describe the turbulence; the single scattering concepts should be just as valid as for the homogeneous layer. The diffracting screen approach offered a convenient means of interpretation of the propagation effects produced by a turbulent layer.

PB 154 922 $19.75

Electronics Research Lab., Illinois Inst. of Tech., Chicago.
INVESTIGATION OF METHODS FOR IMPROVING THE DETECTABILITY AND IDENTIFICATION OF RADAR SIGNALS BY INFORMATION PROCESSING, by George I. Cohn, Lester C. Peach, and Srbislav Zivanovic. Final rept. on Contract AF 19(604)5709. 10 Nov 60, 315p. 21 refs. AFCRL-TR-60-363; AD-251 566.

DESCRIPTORS: *Search radar, *Radar signals, Detection, Data storage systems, *Data processing systems, *Digital computers, Information theory, Mathematical analysis, Statistical analysis, Computers.

Contents:
Linear integrator output statistics
Figure-of-merit for linear integrator
Statistics for statistical detector output
Optimim first-order statistical detector
Figure-of-merit for first-order statistical detector
Comparison of figure-of-merit of linear integrator and first-order statistical detector
Experimental statistical detector
Experimental results
Appendix
Statistical decision theory
Noise statistics and scintillation
Mathematical appendix

PB 154 560 $4.60

Institute of Mathematical Sciences, New York U., N. Y.
EXPANSION PROBLEMS ARISING FROM THE WATSON TRANSFORMATION, by Eugene Pflumm. Rept. on Contract AF 49(638)229. Oct 60, 44p. 4 refs. Research rept. no. BR-35; AFOSR-TN-60-1242; AD-254 787.

DESCRIPTORS: *Series, *Transformations (Mathematics), Special functions, Electromagnetic waves, Propagation, Functions.

The Watson transformation permits us to express the radial dependency of certain wave functions in terms of Hankel functions of complex order. These Hankel functions may be considered as "eigenfunctions" of a non-self-adjoint boundary value problem for Bessel's differential operator. It turns out that in general an arbitrary function cannot be expanded in a series involving these eigenfunctions, not even if very strong conditions are imposed on the arbitrary function. However, there exist sufficiently 'weak' non-self-adjoint perturbations of a selfadjoint problem connected with Bessel's operator for which an expansion theorem for an arbitrary function in terms of the eigenfunctions can be proven. (Author)

PB 156 303 $13.00

Melpar, Inc., Boston, Mass.
PULSE COMPRESSION AND CODED WAVEFORM TECHNIQUES, by Albert K. Nuttall. Technical note on Contract AF 30(602)1953. 15 Mar 59, 182p. 9 refs. RADC-TN-59-177; AD-219 116.

This report released for sale to the public 6 June 61.

DESCRIPTORS: *Radar pulses, *Search radar, Coding, Mathematical analysis, *Radiofrequency filters, Signals.

A signal generated by a bank of parallel filters is investigated for pulse compression and coded waveform possibilities. The outputs of the parallel bank are each multiplied by either plus or minus one, and added to form a noise-like transmitted signal. The construction of an approximate receiving matched filter with its inherent ambiguity and resolution are investigated. The coding arrangement of plus and minus ones is found to be very critical to good system performance, and some partial results on acceptable codes are given. The control of residues in the ambiguity surface is accomplished with proper filter frequency spacing and special coding sequences. A pulse compression ratio of 125 seems feasible. (Author)

PB 154 933 $1.60

Technical U., Copenhagen (Denmark).
COMPARISON OF E-FIELD LOSSES AND H-FIELD LOSSES FOR LOW FREQUENCY ANTENNAS WITH GROUND WIRE SYSTEMS, by Tove Larsen. Technical note no. 1 on Contract AF 61(052)319. Mar 60, 19p. 7 refs. AFCRL-TN-60-984; AD-251 931.

DESCRIPTORS: *Electromagnetic fields, Wire, Electric fields, Magnetic fields, *Antennas, Low-frequency, Electromagnetic theory, *Wave transmission, Intensity, Denmark, Conductivity.

The ratio of the E-field losses to the H-field losses in a ground with a ground wire system is calculated. Numerical computations of this ratio as a function of the constants of the wire grid and the conductivity of the ground are performed for an electromagnetic field, where the vertical electric field strength at the ground plane is equal to the product of the impedance of free space and the tangential magnetic field strength at the surface of the ground. The ratio of the E-field losses to the H-field losses for a certain antenna system may be determined from these results if the ratio between the electric and the magnetic field strength is known at each point of the ground surface around the antenna system. (Author)

PB 155 548 $7.60

Washington U. [Seattle]. Coll. of Engineering.
DIFFRACTION BY A PERIODICALLY APERTURED CONDUCTING SCREEN, by Richard B. Kieburtz, Akira Ishimaru, and Gedalia Held. Technical rept. no. 48 on Contract AF 19(604)4098. Jan 61, 79p. 16 refs. AFCRL-101; AD-253 950.

DESCRIPTORS: *Electromagnetic waves, *Diffraction, *Electric fields, Resonance, Voltage, Integral equations, Green's function, Mathematical analysis, Excitation, Wire screens.

This report presents a rigorous solution to the boundary value problem of diffraction of a plane electromagnetic wave by a conducting plane screen containing s doubly periodic array of square apertures. The electric field in a square aperture is evaluated for several values of aperture width. The solution is valid for a range of dimensions which includes the aperture resonance region. The magnitude and phase of the voltage transmission coefficient are evaluated from the aperture field, and are found to exhibit a resonance for $ka \simeq 1.5$ where k is the wave number and a the aperture width. The problem has been formulated in terms of an integral equation, starting from the differential-integral equation method of Copson. The integral equation is then solved for the

case in which the boundaries are periodic over a plane, by use of a periodic Green's function. The solution for the aperture field is obtained as a rapidly convergent series of functions. This solution is valid for normally incident excitation and for aperture spacing less than a wavelength. (Author)

PB 154 912 $4.60

Washington U. [Seattle]. Coll. of Engineering.
THE VARIATIONAL METHOD FOR EVALUATION OF SCATTERING OF ELECTROMAGNETIC WAVES BY OBSTACLES. II. SCATTERING BY A PERIODICALLY APERTURED CONDUCTING SCREEN, by Richard B. Kieburtz, Akira Ishimaru, and Gedalia Held. Technical rept. no. 47 on Contract AF 19(604)4098. Jan 61, 45p. 10 refs. AFCRL-100; AD-251 832.

DESCRIPTORS: *Electromagnetic waves, Scattering, Green's function, *Waveguides, Functions, Propagation, Integral equations, Diffraction, *Slot antennas, Distribution, *Tensor analysis, Bessel functions, Circuits, Mathematical analysis.

Calculations are presented of the scattering by a plane conducting screen containing a periodic array of square apertures. A variational method is employed, and the results are obtained as a function of wave number and as a function of aperture size for normally incident plane wave excitation. Several interesting effects are observed in the results, including a resonant behavior resulting in complete transmission by the screen, and the Wood anomalies resulting in nearly complete scattering of the incident energy. Some results are presented for the square resonant aperture in a square waveguide excited by the TE11 mode. These calculations are compared with experiment and found to agree quite closely. Some applications of apertured screens to current antenna problems are discussed. Such structures can be important in the design of flush-mounted traveling wave antennas. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 156 297 $3.60

[General] Applied Science Labs., Inc., Hempstead, N. Y.
METHODS FOR ANALYZING SHOCK VIBRATION. PART I. METHODS OF ANALYSIS OF COMPLEX TIME VARYING FUNCTIONS, by John R. Ragazzini, Harold Saks, and Myron Kaufman. Library rept. no. 1 on Contract DA 36-039-sc-73022. 23 Jan 57, 34p. 57 refs. Gruen rept. no. 1002-L-1; AD-204 756.

This report released for sale to the public 6 June 61.

DESCRIPTORS: *Vibration, Spectrographic analysis, *Shock, *Experimental data, Test methods, *Magnetic recording systems, Mathematical analysis, Complex variables, Partial differential equations, Time lag theory.

Contents:
On the filter problem of the power-spectrum analyzer
Communications applications of correlation analysis
Methods of obtaining amplitude-frequency spectra
Short-time autocorrelation functions and power spectra
The response of a resonant system to a gliding tone
Response of a linear resonant system to excitation of a frequency varying linearly with time
Measuring noise color
The sampling theory of power spectrum estimates
The principles and practice of panoramic display
An 8000-c sound spectrograph
Methods and instruments for the visual analysis of complex audio waveforms
High-speed, high-resolution spectrum analyzer
A spectrum analyzer for the 100- to 100,000-c range
Automatic wave analyzer
Analog equipment for processing randomly fluctuating data
A computer for correlation functions
Shock spectrum computer for frequencies up to 2,000 c
A method of repetitive examination of transient phenomena
A high-speed correlator
An extremely wide range electronically deviable oscillator

PB 156 296 $2.60

[General] Applied Science Labs., Inc., Hempstead, N. Y.
METHODS FOR ANALYZING SHOCK AND VIBRATION, PART II. FATIGUE AND MATERIALS FAILURE, by Myron Kaufman. Library rept. no. 2. Rept. on Contract DA 36-039-sc-73022. 9 May 57, 28p. 29 refs. Gruen rept. no. 1002-L-2; AD-204 755.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Vibration, Spectrographic analysis, *Shock, *Experimental data, *Metals, Fatigue (Mechanics), Tests, Failure (Mechanics), Materials, *Aerodynamic data.

Contents:
The influence of temperature on the fatigue of metals
Cumulative fatigue damage
Cumulative damage under random loading
Random noise fatigue testing
An investigation into the suitability of shock testing as a means of thermionic valve selection for missile control systems
A concept of fatigue damage
Some aspects of ground and flight vibration tests
On structural fatigue under random loading
Cumulative damage in fatigue
Transients in mechanical systems
Some fatigue characteristics of a two-spar light alloy structure (Meteor 4 tailplane)
Influence of duration of impact on damage to some elastic systems
Some observations on the relationship between fatigue and internal friction
Very high-speed fatigue testing
Bibliography
(See also PB 156 297)

PB 171 818 $1.00

Naval Ordnance Lab., White Oak, Md.
OPERATING INSTRUCTIONS, FOLDED CUT-FILM SMEAR CAMERA, by Paul Donovan and David

McLanahan. 10 Jan 61, 33p. 4 refs. NAVORD rept. 6927; AD-254 083.

DESCRIPTORS: *Rotating mirror cameras, Design, Construction, Operation, Cameras.

A rotating-mirror smear camera with a magnified image and using Polaroid Film or any standard 4x5-inch film or plate has been designed and constructed for small charge and detonator research. Operating at f/18, the image is approximately three times the size of the test object, and writing speeds of 4 mm per microsec are attained. An internal variable-width slit controls time resolution and exposure. The camera box measures 30x30 1/2x7 inches without the lens tube and is mounted on an angle iron stand containing the electric motor driving the mirror. A 12-inch f/4.5 lens is mounted in a 3-inch diameter tube 24 inches long protruding horizontally from the camera box 49 1/2 inches above the floor. One 5-foot relay rack houses the speed control, timing, and synchronizing gear which is also described. The Polaroid film capability increases the camera's working efficiency over previous NOL smear cameras as the record can be viewed soon after exposure, without additional processing facilities. In addition to the operating instructions, design and construction are covered, and a list of drawings is included. (Author)

PB 155 215 $2.60

Zator Co., Cambridge, Mass.
RESEARCH IN INDUCTIVE INFERENCE, by R. J. Solomonoff. Progress rept. for 1 Apr 59-30 Nov 60 on Contract AF 49(638)376. Jan 61, 21p. 4 refs. ZTB-139; AFOSR-160; AD-252 446.

DESCRIPTORS: *Documentation, Language, Reading machines, Mathematical analysis, Theory, *Machine translation, Programming, *Probability, *Sequences.

The principal progress made was in the discovery of what are apparently several equivalent formal solutions to the general inductive inference problem. These solutions are applicable to numerical and/or non-numerical and/or analog and/or digital data. Any type of information that is available can be made part of the evidence upon which the inferences are made. These general induction methods were applied to several specific problems in non-numerical prediction. Some computer programs were written for the discovery of regularities in English text and any other sequence of symbols. Some work was done toward programming a computer to learn to assign descriptors to documents. Before the new inference methods were discovered, much time was spent on the problem of discovering the grammars of phrase structure languages from a body of text alone. Since then, the general inference methods have cleared up a serious point of difficulty in this problem. Another problem upon which considerable progress was made is the problem of programming a computer to improve its own inference methods. (Author)

PB 155 476 $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
ESTIMATION OF THE BINOMIAL DISTRIBUTION, by John Mott-Smith. Dec 60, 23p. AFCRL-TR-60-367; AD-253 366.

DESCRIPTORS: Numerical methods and procedures, *Information theory.

The binomial tail E(n, s, p) is bounded above and the error is bounded above and below. The result is a numerically useful closed-form estimate for arbitrary values of n, s, and p. The maximum error for fixed n and s occurs when p equals $(s + 1)/(n + 1)$, and is less than approximately 13 percent as n infinity when s and n-s are 0(n). (Author)

PB 155 307 $2.60

California U., Los Angeles.
ON THE OPTIMUM SYNTHESIS OF DISCRETE MULTIPOLE FILTERS WITH RANDOM AND NON-RANDOM INPUTS, by H. C. Hsieh. Rept. on Contract AF 49(638)438. Dec 60, 29p. 6 refs. Dept. of Engineering rept. no. 60-106; AFOSR-162; AD-253 105.

DESCRIPTORS: *Memory devices, Matrix algebra, Information theory, Integral equations.

Consideration was given to the optimum synthesis of discrete filters with n inputs and m outputs. The signal portion of each input shall consist of a nonstationary random component and a nonrandom component which can be described by linear combination of some known functions. Each signal is corrupted by an additive nonstationary random noise. The synthesis criteria employed are that each system error, which is defined as the difference between the actual and ideal outputs, has zero ensemble mean and that each system ensemble mean square error is minimum. It is noticed that the synthesis procedure for this problem is very similar to that for a sampled data multipole continuous filter considered previously by the author. (Author)

AD-255 656 repriced $0.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN EXPERIMENTAL COMMUNICATION CENTER FOR SCIENTIFIC AND TECHNICAL INFORMATION, by M. M. Kessler. Rept. on Contract AF 19(604)5200. 31 Mar 60, 20p. 4G-0002.

DESCRIPTORS: *Scientific reports, *Documentation, *Data processing systems, *Data transmission systems, Coding, *Communication systems.

It is not clear that an elaborate system of information retrieval alone will add significantly to the flow of scientific information.

PB 155 463 $10.50

Alaska U., College.
NAPASKIAK, AN ESKIMO VILLAGE IN WESTERN ALASKA, by W. H. Oswalt. Jan 61, 133p. 5 refs. AAL Technical rept. 57-23; AD-254 826.

DESCRIPTORS: *Eskimos, Alaska, *Anthropology.

The problem of this study as originally formulated and as carried out was to determine current social conditions in a western Eskimo village free from any extreme exotic influences. This study was to serve as the foundation for later analyses of situations in which there is contact between Eskimos and Armed Forces personnel and was completed in 1956. The findings indicate that life in Napaskiak is primarily oriented toward a hunting-fishing-trapping-wage economy. Village interests center in Greek Russian Orthodox Church activities, the steam bath, and sex. It is recommended that any movements of Armed Forces personnel into any western Eskimo village be preceded by a careful consideration of the village social system, as defined in the body of this report, so that a satisfactory relationship with the indigenous population may be established and maintained. (Author)

PB 154 224 $1.60

Arctic Aeromedical Lab. [Fort Wainwright] Alaska.
SWEDISH LAPPLAND: A BRIEF DESCRIPTION OF THE DWELLINGS AND WINTER-LIVING TECHNIQUES OF THE SWEDISH MOUNTAIN LAPPS, by Frederick A. Milan. Oct 60, 19p. 6 refs. Technical rept. 60-7; AD-249 797.

DESCRIPTORS: *Sweden, *Sociology, Ecology, Climatic factors, Arctic regions, *Housing, Clothing, Diet, Anthropology.

Extensive literature has been collected concerning the folkways, physical anthropology, and language of the Lapps. This literature dates from the Germania of the Greek historian Tacitus, and includes references to the Lapps in 13th Century Icelandic Sagas, works by Linnaeus (Karl von Linne), and the autobiographies: Muittalis samid birra, by Johan Turi, and En Nomad och Hans Liv, by Anta Pirak. From the foregoing description, it can be seen that some of the Lapps, especially the nomadic ones, are a meat-eating people, living an arduous life in the cold. In contrast to the Eskimos, who live under similar conditions, little is know about the physiology of the Lapps. This knowledge could be obtained through physiological field investigations. Both the Lapps and the Eskimos have adjusted culturally to their environment. Possibly the former have adjusted their physiology as well. (Author)

PB 154 991 $4.60

Columbia U., New York.
EFFECT OF THE U-2 INCIDENT: PRELIMINARY ANALYSIS, by Jiri Nehnevajsa. Rept. on Research on Comparative Impact of Actual Versus Anticipated Events, Proj. Outcomes, Contract AF 49(638)743. 10 Oct 60, 42p. [AFOSR] TN-60-1357A; AD-251 734.

DESCRIPTORS: *Sociology, Theory, *Foreign policy, *Political science, *Attitudes, *Public opinion, *Perception, Probability, Test methods, Statistical analysis.

The U-2 incident was highly salient for the respondents directly involved in this research. The incident's effect, among others to be further studied, was to modify the perception of the existing level of international tensions, and to modify the anticipations of future tensions as well as ideas about past tensions. Yet, it does not seem to have been viewed as a permanent type of change in the tone of international relations. While post-U-2 respondents do expect the tensions in the future to be higher than do pre-U-2 respondents, a leveling off process seems to be seen. (Author)

PB 154 993 $7.60

Columbia U., New York.
EXPLORATION IN IDEOLOGICAL CONFLICT, by Jiri Nehnevajsa. Rept. on Research on Comparative Impact of Actual Versus Anticipated Events, Proj. Outcomes, Contract AF 49(638)743. 10 Oct 60, 71p. [AFOSR] TN-60-1359B; AD-251 731.

DESCRIPTORS: *Sociology, *Reasoning, USSR, *Political science, *Attitudes, *Perception, Theory, Group dynamics, Personnel, Behavior, Measurement, Determination, Probability, Mathematical prediction, Test methods, Foreign policy.

A new theoretical approach to the analysis of ideological conflicts is presented. The analysis was performed in relation to outcomes which are, in turn, specifications of future states of the total system. As such, these outcomes include the consideration of all goals and all moves of all components - hence involving all antagonists. Variable acceptability along the desirability dimension measures the ideology of a particular referent; and the degree of disagreement in such acceptability vectors measures the ideological conflict between any two referents viewed simultaneously. It was felt that an appropriate index of ideological conflict is given by the complement of some relevant correlation coefficient over the set of outcomes, each of which is characterized by desirability. Using data from the Project Pretest - in which Italian, Canadian, Chinese and Iranian University students currently in the United States were questioned along with a few American University students - several hypotheses were developed and tested. (Author)

PB 154 992 $3.60

Columbia U., New York.
FURTHER ANALYSIS OF THE U-2 INCIDENT: EFFECTS OF AN EVENT, by Jiri Nehnevajsa. Rept. on Research on Comparative Impact of Actual Versus Anticipated Events, Proj. Outcomes, Contract AF 49(638)743. 10 Oct 60, 39p. [AFOSR] TN-60-1357B; AD-251 735.

DESCRIPTORS: *Sociology, Theory, *Foreign policy, *Attitudes, *Public opinion, Test methods, *Political science, *Perception, Probability.

Fourteen basic hypotheses are formulated about the impact of the U-2 incident, an example of an internationally relevant event, upon salient variables of this research. The variables explicitly considered include: (1) assessment of tension level; (2) probabilities of various outcomes with respect to 1965; (3) desirabilities of various outcomes; (4) personal sense of efficacy; (5) attributed efficacy to one's country; and (6) final outcome of the Cold War. In every instance, the hypotheses are strongly supported by the data. The findings are analyzed and discussed. (Author)

PB 154 994 $1.60

Columbia U., New York.
SOME COLD WAR EFFECTS OF SPACE ACTIVITIES, by Jiri Nehnevajsa. Rept. on Research on Comparative Impact of Actual Versus Anticipated Events, Proj. Outcomes, Contract AF 49(638)743. 20 Dec 60, 16p. [AFOSR] TN-60-1429; AD-251 886.

DESCRIPTORS: *Sociology, Theory, *Political science, *Behavior, Space flight, *Attitudes, *Public opinion, Test methods, Statistical analysis, Probability.

Some preliminary results from an on-going research study of international political behavior are discussed, and the types of further data expected to be obtained from it which have bearing on the problem are specified. The place of the particular information in the context of broader data requirements is indicated to permit an analysis and understanding of the interactions between the Cold War and unfolding space activities. (Author)

PB 156 118 $2.60

Stanford U., Calif.
EXTERNAL ECONOMIES AND THE JUSTIFICATION OF PUBLIC INVESTMENT, by Julius Margolis. Technical rept. no. 22 on Contract N6onr-25133. 25 Oct 55, 28p. 40 refs. AD-75 874.

This report released for sale to the public 7 June 61.

DESCRIPTORS: *Economics, Economic conditions, Social sciences, *Money, *Political science, Theory, Irrigation systems, *Federal budgets.

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- Establishing a new business

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- Basic records of national income and product, regional trends, balance of payments, foreign aid

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- Distribution channels, facilities and services
- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
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- Statistics on imports and exports
- Investment and trade opportunities abroad
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